ARMY RESEARCH LABORATORY

Acoustic Data Collection of Tactical Unmanned Air Vehicles (TUAVs)

by Tien Pham and Leng Sim

ARL-TR-2749 December 2002

Approved for public release; distribution unlimited.

20030213 042

NOTICES

Disclaimers

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

Citation of manufacturer's or trade names does not constitute an official endorsement or approval of the use thereof.

Destroy this report when it is no longer needed. Do not return it to the originator.

Army Research Laboratory
Adelphi, MD 20783-1197

ARL-TR-2749 **December 2002**

Acoustic Data Collection of Tactical Unmanned Air Vehicles (TUAVs)

Tien Pham and Leng Sim
Sensors and Electron Devices Directorate, ARL

Approved for public release; distribution unlimited.

Contents

List of Figures

List of Tables

1. Introduction

Acoustic sensing technology offers many tactical advantages for the military. The sensors are passive, have non-line-of-sight capability, and are small, low-power, robust, and inexpensive. Acoustic microphones configured in an array are capable of classifying/identifying and estimating the azimuth and elevation angles to detected targets of interest at distances of several kilometers. Tactical unmanned air vehicles (TUAVs) are relatively small in size, so they can be difficult to detect optically. In addition, they can maneuver at low altitudes, so they can elude radar detection. A TUAV is powered by either an electric, gas, or turbine engine. Thus, they can emit significant acoustic energy that can be detected and classified over long distances in favorable atmospheric conditions.

The Director of Night Vision and Electronic Sensors Directorate (NVESD), Dr. A. Fenner Milton, asked the U.S. Army Research Laboratory (ARL), specifically the Acoustic Signal Processing Branch, to conduct field experiments to collect acoustic signatures of TUAVs. The purpose of these data collection experiments was to collect raw acoustic signatures of TUAVs and to develop an acoustic database to support activities of the Action Group 6 (AG6) under the Technical Cooperative Program (TTCP). The AG6's main objectives are to improve the understanding and utilization of acoustic sensor technology and to evaluate acoustic sensor performance in the detection, tracking, and classification of TUAVs.[1] Member countries of TTCP's AG6 (United States, United Kingdom, Canada, and Australia) will share the acoustic data.

In support of this task, the Acoustic Signal Processing Branch planned and coordinated with the Maritime UAV Development and Operation (MUDO) team at the Patuxent River Naval Air System Command (PAX River NAVAIR) and conducted field experiments at Webster Field, Patuxent River, MD during 16–24 October 2001 and then again during 10–17 January 2002. The MUDO team provided the test range, range support, TUAVs, and Global Positioning System (GPS) truth and meteorological (MET) information on all test flights; the ARL team provided the sensors and data collection hardware and performed the data collection. Table A-1 in Appendix A lists ARL and NAVAIR personnel who participated in this effort.

2. Test Plan

Four different TUAV vehicles were requested for the data collection exercises: Pioneer, Pointer, Aerolight, and Dragon Eye (see Figures B-1 through B-7 in Appendix B). Due to subsequent events after 11 September 2001, the availability of the TUAVs was very limited. ARL requested a number of test runs (TRs) for each vehicle with different combinations of altitudes and engine revolutions per minute (RPM). A test matrix was formed by starting with a single TR with nomi-

[1]Srour, N. TTCP Terms of Reference. U.S. Army Research Laboratory, Adelphi, MD, June 2000.

nal altitude and RPM values and then varying these flight parameters while respecting safety and regulatory concerns, such as wind speed and allotted airspace. Each TR (Figure 1) is defined as: (1) Take off from point A and fly to point B (or beyond), (2) Turn around and fly to point C (or beyond), and (3) Turn around, fly back, and land at point A. The MUDO team provided GPS run time and MET data for all TRs. However, due to airspace restrictions for certain vehicles at certain times of day, not all TRs followed the desired flight pattern.

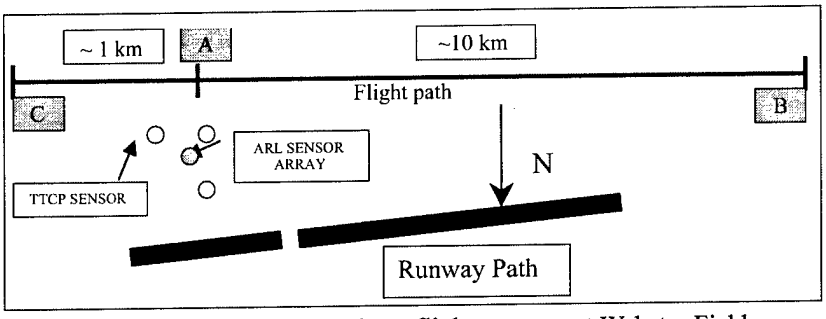


Figure 1. Test setup and proposed test flight patterns at Webster Field.

3. Sensor Arrays and Layouts

Two different acoustic sensor arrays were deployed for the data collection. The first one was ARL's 16-microphone cross array (referred to as the "16X" array shown in Figure 2), and the second one was TTCP's 4-element orthogonal array (referred to as the "4L" array shown in Figure 3). Both arrays were positioned on the ground (grass surface) near the runway (see Figures B-5 through B-7). Both sensor arrays were calibrated at least once each day of testing with a 94-dB sound pressure level (SPL) at 1000 Hz B&K or ACO Pacific calibrator.

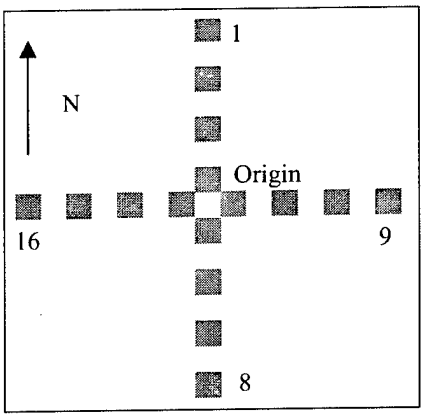


Figure 2. ARL's 16X array: 8-element uniform linear array (ULA) in north-south (N-S) axis and 8-element ULA in east-west (E-W) axis with 1-ft spacing between elements.

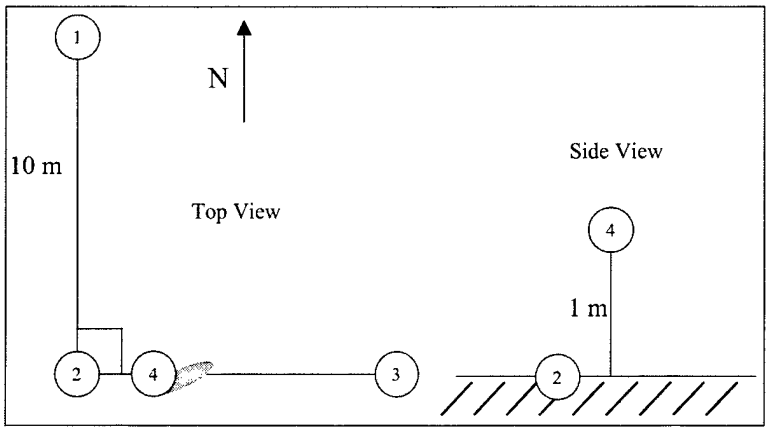


Figure 3. TTCP's 4L array.

3.1 ARL's 16X Sensor Array

The 16X array consists of 16 Knowles microphones, model BL-1994, arranged with two perpendicular 8-element ULAs with 1-ft spacing between elements (Figure 2). The sampling rate for the 16X array was generally set at 4096 Hz, with a cutoff frequency of 1250 Hz, and a front-end gain of 100 was selected for all 16 microphones.

3.2 TTCP's 4L Sensor Array

The 4L array configuration was requested by the Australian TTCP representative. For the tests conducted in October 2001, four 1/2-in B&K microphones (Table A-2 in Appendix A) were used to form the 4L array, of which three elements are configured in an "L" shape on the ground, with a spacing of 10 m between elements and the fourth element elevated 1 m above ground near the center sensor (see Figure 3). For the tests conducted in January 2002, four 1/2-in ACO Pacific microphones were used to form the same array configuration as in October. The exact B&K and ACO Pacific microphones, pre-amps, and power supplies used are listed in Table A-4 in Appendix A. In both cases, the sampling rate for 4L array was generally set at 8192 Hz with a cutoff frequency of 2500 Hz.

4. Field Tests at Webster Field

4.1 Data Collection in October 2001

The first data collection effort started on 16 October 2001 and ended on 24 October 2001, at Webster Field, Patuxent River, MD. Due to equipment failures, TUAV problems, and severe wind conditions, not all data were collected as planned. Equipment problems stemmed from the B&K microphones and ARL's acoustic-data collection equipment (ACE) systems.[2] Most of the problems were based on the selection of processing parameters and a total sampling rate ap-

[2]Mays, B. "Electrical and Software Design Report for the Data Fusion Testbed." ARL-MR-536, U.S. Army Research Laboratory, Adelphi, MD, June 2002.

proaching system throughput limitations. On several occasions, there were problems with the TUAVs or the TUAVs' base station controllers. While Navy personnel were conducting their flight tests and training exercises with the Pioneer vehicle at Webster Field, we were able to piggyback our data collection effort, but were only able to collect a limited amount of sensor data. Testing was cancelled on several days due to severe wind conditions, producing wind speeds exceeding the safety limits of the TUAVs.

There was a total of three TUAVs for the two weeks of testing in October: Pioneer, Aerolite, and Dragon Eye. The unattended ground sensor arrays were placed near the flight path as shown in Figure 1 (see also Figures B-5 and B-6 in Appendix B). The positions of the sensor elements were recorded using a handheld differential GPS receiver (Table A-3).

The data collected by the ACE systems are in binary format. A listing of all the original binary data files has been compiled (see Appendix C for details). The binary data were processed and reduced in Matlab. The resulting time series data files, in "mat" format, are much smaller and more manageable. The files are designated as follows:

aaa_bbb_mmddyyyy_hhmmss_ccc.mat ,

where

aaa:	**arl** for ARL's 16X array **tcp** for TTCP's 4L array
bb:	**ns** for N-S ULA segment of 16X array **ew** for E-W ULA segment of 16X array **a1** for 4L array **a2** for back-up 4L array **a3** for back-up 4L array using Knowles (see section 4.2)
mmddyyyy:	month, date and year
hhmmss:	hours, minutes and seconds
ccc:	**dat** for time series data **cal** for calibration data **amb** for ambient noise data

For example, the file **arl_ew_10162001_171043_dat.mat** designates time series data from the E-W ULA segment of ARL's 16X array collected on 16 October 2001 at 17:10:43.

4.1.1 16 October 2002

The 16X array and the first three (nonelevated) elements of the 4L array were sampled at 4196 Hz with a cutoff frequency of 1250 Hz. The fourth element (elevated 1 m above ground) of the 4L array was sampled at 8192 Hz with a cutoff frequency of 2510 Hz. The pre-amp gain and the signal-conditioning box gain of the 16X array were each set at 10, for a total gain of 100. The

signal-conditioning box gain of the 4L array was set at 100. The gain for the 4L array was set at 100 at the signal conditioning box. The wind speed was at about 10–15 kn, with gusts up to 25 kn.

4.1.2 18–19 October 2002

The 16X array and the first three (nonelevated) elements of the 4L array were sampled at 4196 Hz with a cutoff frequency of 1250 Hz. The fourth element (elevated 1 m above ground) of the 4L array was sampled at 10240 Hz with a cutoff frequency at 5100 Hz. The gain settings for both arrays were unchanged. The wind condition was at about 5–8 kn, with wind gusts up to 10 kn.

4.1.3 24 October 2002

The 16X array and the 4L array were sampled at 8192 Hz with a cutoff frequency of 2510 Hz. The gain settings for both arrays were unchanged. The wind condition was at about 5–8 kn, with wind gusts up to 10 kn.

4.2 Data Collection in January 2002

The second data collection effort started on 10 January 2002 and ended on 17 January 2002, at Webster Field, Patuxent River, MD. There was a total of two TUAVs: Pioneer and Pointer. The sensor arrays were placed near the flight path—the same location with respect to the runways as the October test, as shown in Figure 1 (see also Figures B-5 and B-6 in Appendix B). Due to microphone problems during the October 2001 tests, additional 4L arrays were set up for the January 2002 tests. ARL personnel set up two additional 4L arrays adjacent to the first 4L array: one array composed of ACO Pacific microphones and one array composed of Knowles microphones. Figure 4 shows the relative positions of the arrays. The positions of sensor elements were recorded using a handheld differentiable GPS receiver (see Table A-5).

Again, the data collected by the ACE systems are in binary format. A listing of all the original binary data files has been compiled (see further details in Appendix C). The binary data were processed and reduced in Matlab as in the October field tests.

5. GPS and MET Data

GPS and MET data were requested for all flight tests conducted at Webster Field, Patuxent River, MD. ARL received the GPS and MET data stored in Microsoft Excel and Microsoft Word files, respectively; they have file designations similar to the time series data files (see section 4.1). Some TUAVs such as Pioneer and Exdrone were designed before the availability of GPS. GPS systems were later added to provided better ground truth; therefore, they have their own cataloging system with different update rates. For example, the Pioneer has updates of approximately 1.6 s. All of the GPS data have been converted to UTM coordinates.

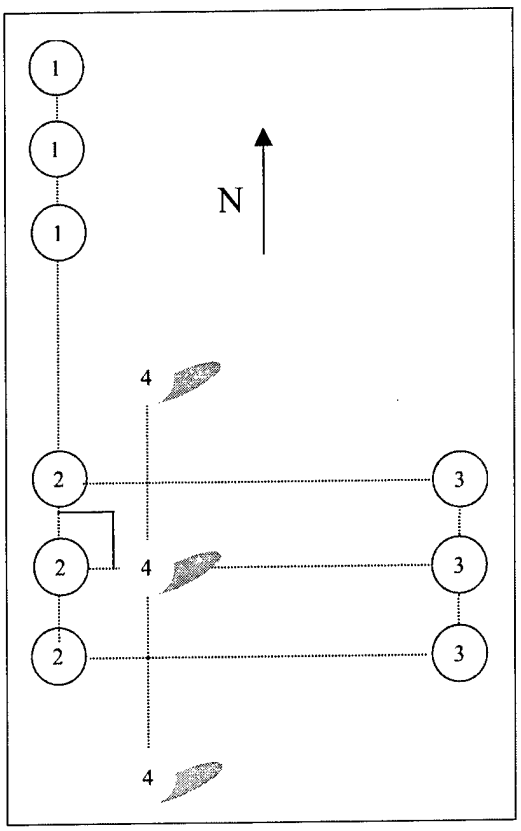


Figure 4. Modified TTCP's 4L arrays setup for January 2002 field tests.

6. Summary and Future Work

In summary, acoustic data from four different TUAVs were collected using two different unattended ground sensor arrays: ARL's 16-element cross array and TTCP's 4-element orthogonal array. From cursory analysis, the overall quality of the data is high. However, due to some equipment problems in the October field tests, some of the data channels, especially for the TTCP array, were affected. The equipment problems were resolved prior to the subsequent January field tests.

In the spring of 2002, ARL provided to the participating TTCP countries three compact disks (CDs) containing the TUAV data along with GPS ground truth and MET data collected in October 2001 and January 2002. The content of the three CDs is shown in Figures D-1 through D-3 in Appendix D. Details and comments on the test flights can be found in Appendix E in Tables E-1 and E-2. The original binary data will not be distributed due to the shear volume (over 15 CDs worth of data). However, if there is a specific need for binary data, a request can be made to Mr. Nino Srour at ARL. ARL plans to conduct additional field tests in the future to collect acoustic data of different TUAV targets when the opportunities arise or when specific targets of interest are available. ARL plans to analyze the TUAV data to determine maximum detection ranges and direction finding capabilities of unattended ground sensors against this class of targets and present the results at the next AG6 meeting and in a follow-on technical report.

Appendix A. Points of Contact and Microphone and Array Information

A.1 List of Points of Contact (POCs)

Table A-1. List of personnel that participated in the tactical unmanned air vehicles (TUAV) data collection effort at Webster Field, Patuxent River, MD.

Name	Organization	Email	Telephone
Nino Srour	ARL	nsrour@arl.army.mil	(301) 394-2623
Tien Pham	ARL	tpham@arl.army.mil	(301) 394-4282
Leng Sim	ARL	lsim@arl.army.mil	(301) 394-2179
Dorothea Nicali	ARL	dnicali@arl.army.mil	(301) 394-4424
Andy Pontzer	NAVAIR	PontzerAE@navair.navy.mil	(301) 862-8023
Michael Dean	NAVAIR	—	(301) 862-8177
Lt. Trung Nguyen	NAVAIR	—	(301) 862-8023

Notes: ARL = U.S. Army Research Laboratory; NAVAIR = Naval Air System Command.

A.2 October 2001 Tests (Tables A-2 and A-3)

A listing of the data files has been compliled and can be found in the Microsoft Excel file **TUAV_Oct_01_data.xls**.[1] The corresponding data files are in binary format (i.e., filename.dat) and are designated as follows:

yyyy_mm_dd_hh_mm_ss_aaaa_gggg.dat

where

yyyy: year
mm: month
dd: date
hh: hours
mm: minutes
ss: seconds
aaaa: sensor number
gggg: sensor group number

For example, the file name "2001_10_16_16_43_03_sen8_grp1.dat" designates the start time (in Greenwich Mean Time [GMT]) of the data file to be 16:43:03 on 10/16/2001. "sen8" designates ARL's acoustic data collection equipment (ACE) number, and "grp1" designates the junction box number. Each junction box has a maximum of eight channels, and each ACE can accommodate up to eight junction boxes.

[1]Sim, L. TUAV-Oct-01-data.xls file. U.S. Army Research Laboratory, Adelphi, MD, April 2002.

Table A-2. B&K microphones used in October 2001 tests.

Signal Conditioning	Power Supply	Microphones (serial no.)	Pre-Amp (model no.)	Cables
Box1 CH1	2804/1606441	4134/1534453	2669/1888669	2639/1391436
Box1 CH2	2804/1606441	4134/218281	2669/1856886	2639/1688712
Box2 CH1	2804/1606439	4191/1892171	2669/1856888	2639/1595767
Box2 CH2	2804/1606439	4191/1892170	2669/1856896	A0-0428
Box3 CH1	5935/1878410	4155/1394122	2669/1856892	A0-0428
Box3 CH2	5935/1878410	4149/1227241	2669/1856894	A0-0428
	2804/1668857			

Table A-3. Sensor array GPS coordinates for October 2001 test.

Sensor Array Coordinates Universal Transverse Mercator (UTM)			
Array	Sensor No.	North	East
16X	sensor 1	4222971	375039
16X	sensor 8	4222968	375039
16X	sensor 9	4222970	375040
16X	sensor 16	4222970	375039
4L	sensor 1	4222980	375039
4L	sensor 2	4222970	375039
4L	sensor 3	4222971	375048
4L	sensor 4	4222970	375039

A.3 January 2002 Tests (Tables A-4 and A-5)

A listing of the data files has been compiled and can be found in the Microsoft Excel file **TUAV_Jan_02_data.xls**.[2]

Table A-4. ACO Pacific microphones used in January 2002 tests.

Signal Conditioning	Power Supply	Microphones (serial no.)	Pre-Amp (model no.)	Cables
Box1 CH1	10296-2	26057	01296-6	Box1 Mic1
Box1 CH2	10296-2	26058	01296-1	Box1 Mic2
Box2 CH1	10296-4	26080	01296-2	Box2 Mic1
Box2 CH2	10296-4	26076	01296-3	Box2 Mic2
Box3 CH1	10296-3	26059	01296-7	Box3 Mic1
Box3 CH2	10296-3	26061	01296-4	Box3 Mic2
Box4 CH1	10296-1	26062	01296-5	Box4 Mic1
Box4 CH2	10296-1	26060	01296-8	Box4 Mic2

Table A-5. Sensor array GPS coordinates for January 2002 test.

Sensor Array Coordinate (UTM)			
Array	Sensor No.	North	East
16X	origin	4222975	375042
4L	sensor 1	4222981	375035
4L	sensor 2	4222973	370536
4L	sensor 3	4222973	370546
4L	sensor 4	4222975	375042

[2]Sim, L. TUAV-Jan-02-data.xls file. U.S. Army Research Laboratory, Adelphi, MD, April 2002.

Appendix B. Photographs of Tactical Unmanned Air Vehicles (TUAVs)

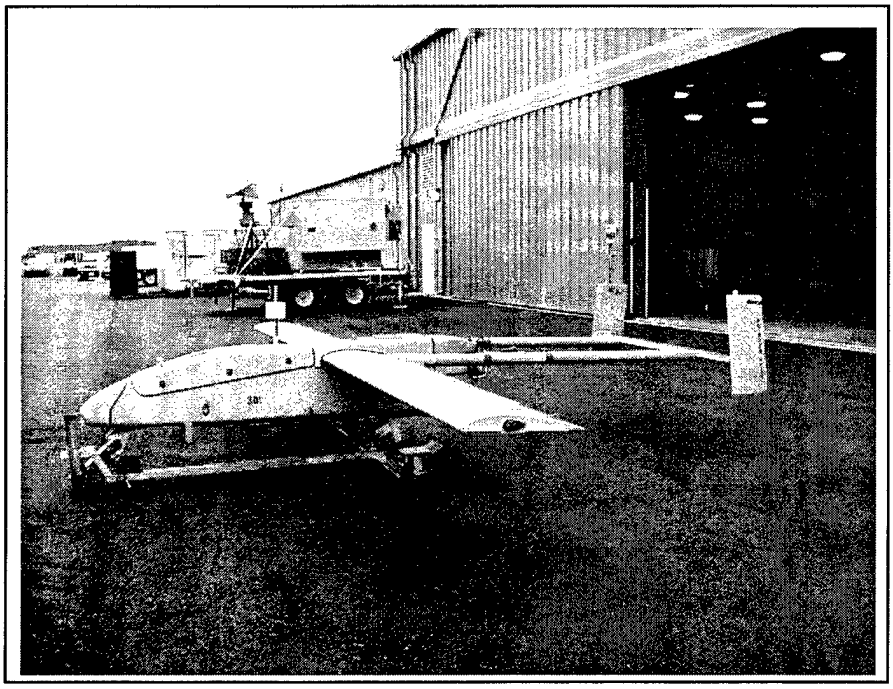


Figure B-1. Pioneer TUAV.

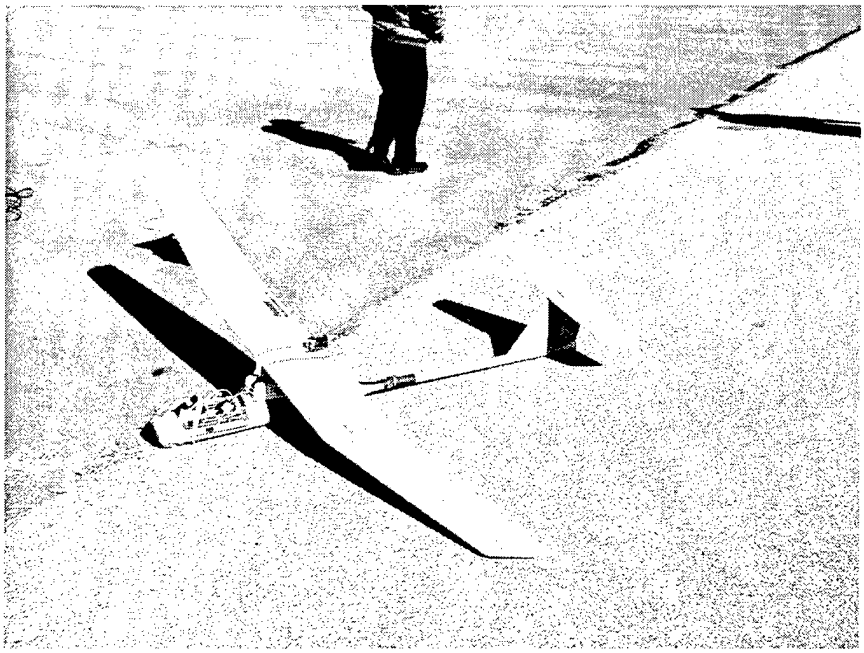


Figure B-2. Pointer UAV.

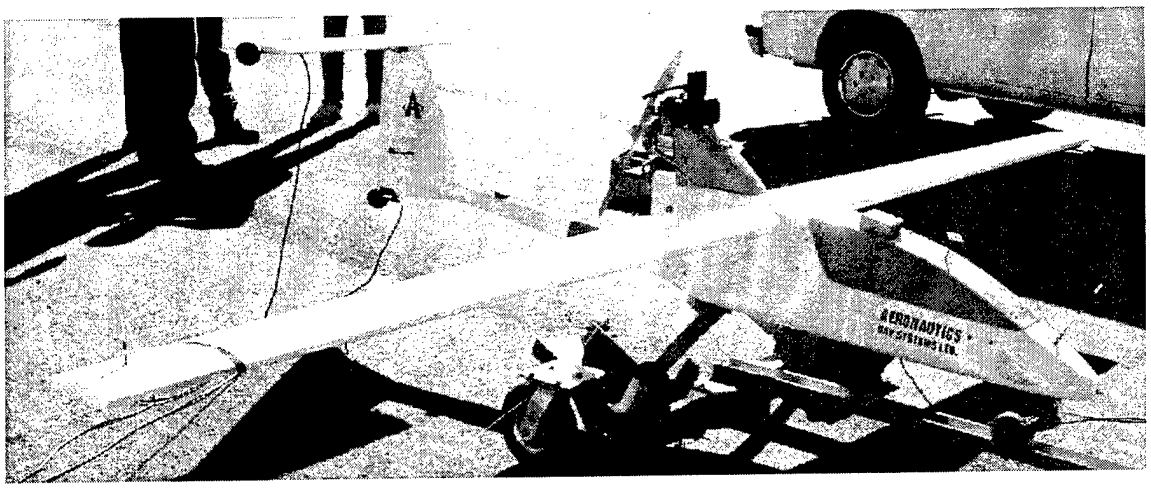


Figure B-3. Aerolight UAV.

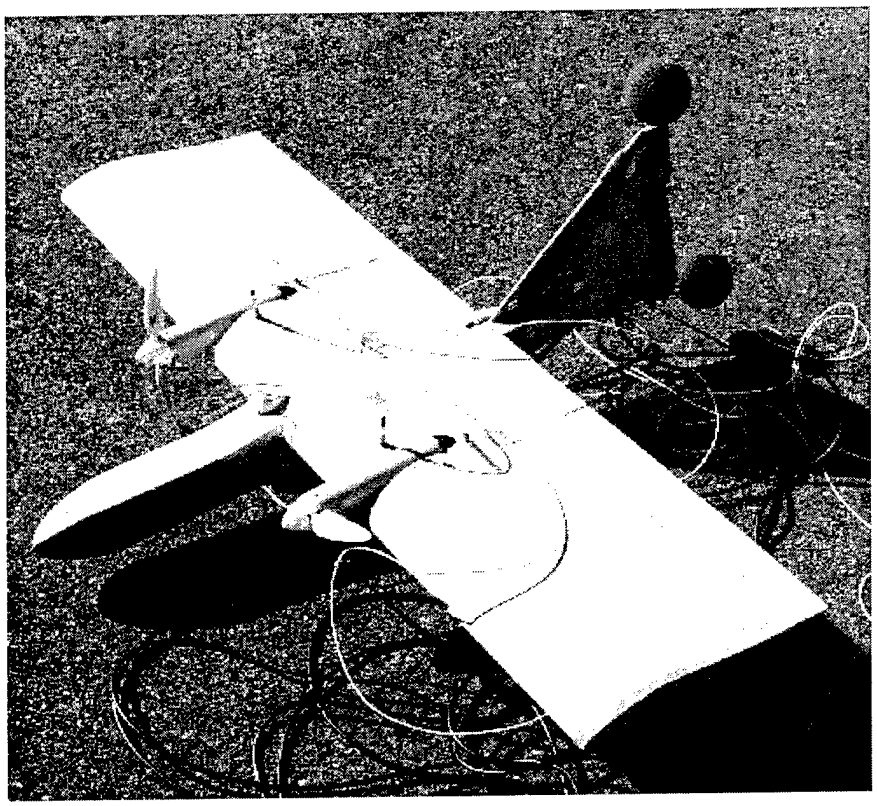


Figure B-4. Dragon Eye UAV.

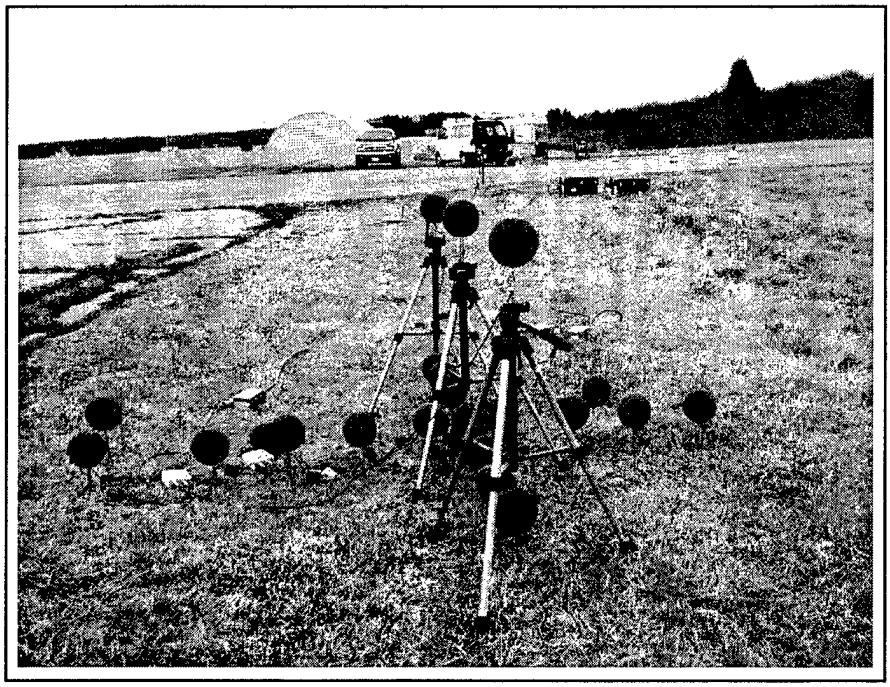


Figure B-5. Sensor arrays.

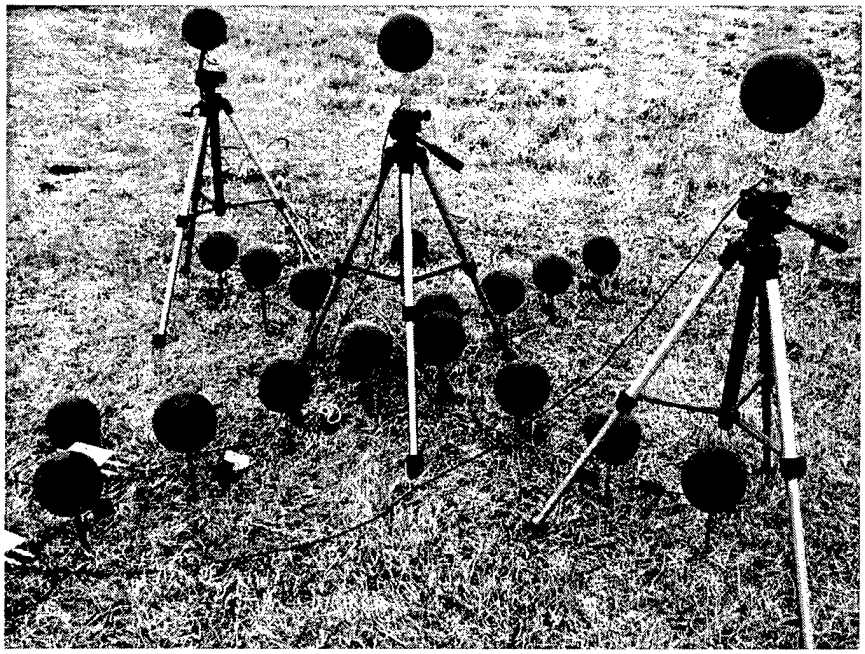


Figure B-6. Sensor arrays (close-up view).

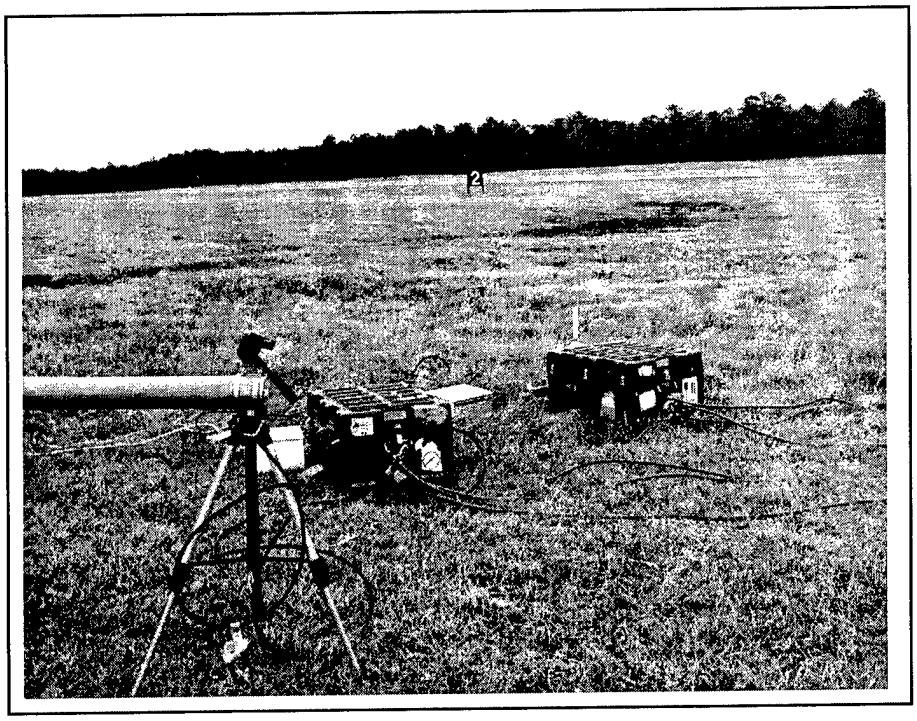


Figure B-7. The U.S. Army Research Laboratory's (ARL's) acoustic-data collection equipment (ACE).

Appendix C. Binary Data File Format and Conversion File

C.1 October 2001 Tests

A listing of the data files has been compiled and can be found in the Microsoft Excel file **TUAV_Oct_01_data.xls**.[1] The corresponding data files are in binary format (i.e., filename.dat) and are designated as follows:

yyyy_mm_dd_hh_mm_ss_aaaa_gggg.dat

where

yyyy: year

mm: month

dd: date

hh: hours

mm: minutes

ss: seconds

aaaa: sensor number

gggg: sensor group number

For example, the file name "2001_10_16_16_43_03_sen8_grp1.dat" designates the start time (in Greenwich Mean Time [GMT]) of the data file to be 16:43:03 on 10/16/2001. "sen8" designates the U.S. Army Research Laboratory's (ARL's) acoustic data collection equipment (ACE) number, and "grp1" designates the junction box number. Each junction box has a maximum of eight channels, and each ACE can accommodate up to eight junction boxes. Table C-1 shows the sensor element within the sensor arrays (16X and 4L) and the corresponding sensor number (ACE number), sensor group number, and channel number.

[1]Sim, L. TUAV-Oct-01-data.xls file. U.S. Army Research Laboratory, Adelphi, MD, April 2002.

Table C-1. Sensor element and corresponding sensor number, group number, and channel number for ARL's 16X array and the Technical Cooperative Program's (TTCP's) 4L array for October 2001 tests.

ARL's 16X Array				
Element No.	**ACE No.**	**Group No.**	**Channel No.**	**Notes**
1	sen7	grp0	0	N-S ULA
2	sen7	grp0	1	N-S ULA
3	sen7	grp0	2	N-S ULA
4	sen7	grp0	3	N-S ULA
5	sen7	grp0	4	N-S ULA
6	sen7	grp0	5	N-S ULA
7	sen7	grp0	6	N-S ULA
8	sen7	grp0	7	N-S ULA
9	sen7	grp1	0	E-W ULA
10	sen7	grp1	1	E-W ULA
11	sen7	grp1	2	E-W ULA
12	sen7	grp1	3	E-W ULA
13	sen7	grp1	4	E-W ULA
14	sen7	grp1	5	E-W ULA
15	sen7	grp1	6	E-W ULA
16	sen7	grp1	7	E-W ULA
TTCP's 4L Array				
2	sen6	grp0	0	
1	sen6	grp0	1	
3	sen6	grp0	2	
	sen6	grp0	3	Not used
4	sen6	grp0	4	
	sen6	grp0	5	Not used
	sen6	grp0	6	Not used
	sen6	grp0	7	Not used
1	sen3	grp2	0	
2	sen3	grp2	1	
	sen3	grp2	2	Not used
3	sen3	grp2	3	
	sen3	grp2	4	Not used
	sen3	grp2	5	Not used
	sen3	grp2	6	Not used
	sen3	grp2	7	Not used
4	sen3	grp3	0	
	sen3	grp3	1	Not used
	sen3	grp3	2	Not used
	sen3	grp3	3	Not used
	sen3	grp3	4	Not used
	sen3	grp3	5	Not used
	sen3	grp3	6	Not used
	sen3	grp3	7	Not used

Notes: N-S = north-south; E-W = east-west; ULA = uniform linear array.

C.2 January 2002 Tests

A listing of the data files has been compiled and can be found in the Microsoft Excel file **TUAV_Jan_02_data.xls**.[2] Table C-2 shows the sensor element within the sensor arrays (16X and 4L) and the corresponding sensor number (ACE number), sensor group number, and channel number.

Table C-2. Sensor element and corresponding sensor number, group number, and channel number for ARL's 16X array and TTCP's 4L array for January 2002 tests.

ARL's 16X Array				
Element No.	**ACE No.**	**Group No.**	**Channel No.**	**Notes**
1	sens5	grp0	0	N-S ULA
2	sens5	grp0	1	N-S ULA
3	sens5	grp0	2	N-S ULA
4	sens5	grp0	3	N-S ULA
5	sens5	grp0	4	N-S ULA
6	sens5	grp0	5	N-S ULA
7	sens5	grp0	6	N-S ULA
8	sens5	grp0	7	N-S ULA
9	sens5	grp1	0	E-W ULA
10	sens5	grp1	1	E-W ULA
11	sens5	grp1	2	E-W ULA
12	sens5	grp1	3	E-W ULA
13	sens5	grp1	4	E-W ULA
14	sens5	grp1	5	E-W ULA
15	sens5	grp1	6	E-W ULA
16	sens5	grp1	7	E-W ULA
TTCP's 4L Array				
1	sen8	grp0	0	
2	sen8	grp0	1	
	sen8	grp0	2	Not used
4	sen8	grp0	3	
	sen8	grp0	4	Not used
	sen8	grp0	5	Not used
	sen8	grp0	6	Not used
	sen8	grp0	7	Not used
1	sen8	grp1	0	
2	sen8	grp1	1	
	sen8	grp1	2	Not used
	sen8	grp1	3	Not used
	sen8	grp1	4	Not used
	sen8	grp1	5	Not used
	sen8	grp1	6	Not used
	sen8	grp1	7	Not used
1	sen8	grp2	0	
2	sen8	grp2	1	
	sen8	grp2	2	Not used
	sen8	grp2	3	Not used
	sen8	grp2	4	Not used
	sen8	grp2	5	Not used
	sen8	grp2	6	Not used

[2]Sim, L. TUAV-Jan-02-data.xls file. U.S. Army Research Laboratory, Adelphi, MD, April 2002.

Table C-2. Sensor element and corresponding sensor number, group number and channel number for ARL's 16X array and TTCP's 4L array for January 2002 tests. (cont'd)

ARL's 16X Array				
Element No.	**ACE No.**	**Group No.**	**Channel No.**	**Notes**
	sen8	grp2	7	Not used
1	sen5	grp2	0	Knowles microphone
2	sen5	grp2	1	Knowles microphone
3	sen5	grp2	2	Knowles microphone
4	sen5	grp2	3	Knowles microphone
	sen5	grp2	4	Not used
	sen5	grp2	5	Not used
	sen5	grp2	6	Not used
	sen5	grp2	7	Not used

C.3 Accessing the Binary Data Files

All of the flight test runs (TRs) are relatively long, with some lasting longer than 15 min. Efforts were made to subdivide the TRs into multiple data files (e.g., separate files for the incoming and outgoing portions of a single TR). Even so, a data file can be very large because the sampling rates were set at either 4096 or 8192 Hz. The listing or raw acoustic data files contained in the two Excel files[1, 2] are in binary format with a customized header developed for the ACE systems by ARL. The exact format structure can be made available upon request. However, data can be read into Matlab using the **covert_bin_to_mat.m** routine provided on the data compact disk (CD) (source code for m-file in section C.4 below). The parameters of interest are (shown in boldface in the code):

file_name: name of file to be read with directory path

number_of_seconds: amount of data to be read in seconds

seconds_to_skip: data pointer

data: variable with acoustic data in Matlab

Depending on the amount of memory on the PC, loading the entire data file in Matlab might be very slow or even impossible. It is recommended that the user take a quick look at the data file by loading only a segment of data from one channel at a time. This can be done by setting **data = [data,temp(2,:)]** for instance (e.g., looking at channel 1 only instead of channels 0–7), setting **number_of_seconds** to a desired segment length, and setting **seconds_to_skip** appropriately to move from current data segment to a subsequent data segment within the data file. Contact ARL personnel listed in Table A-1 if further assistance is needed.

C.4 Convert_bin_to_mat.m source code

% Convert_bin_to_mat.m
%
% by: B.Mays and T. Pham
% US Army Research Laboratory
% modified: 2/20/02

```
%%%Initialization%%%
clear; close all;
%Decimate for R > 1
R=1;
% Attemp to load calibration data
%load cal_results;
cal_results = [1 1 1 1 1 1 1 1];c al_results = cal_results';
% Set up look up vector for gain factors as read from packet header
% Gain values range from 0 to 7 and map as follows:
% 0=10,1=100,2=100,3=1000,4=1000,5=10000,6=10000,7=100000
gain_vector=[1;10;10;100;100;1000;1000;10000];

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%File to be load%%%
file_name = 'f:\2001_10_18_20_00_21_Sen6_Grp0.dat';
%file_name = 'G:\Sen4\s4_1216_034134.dat';
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%Number of seconds worth of data to be load%%%
number_of_seconds =30;
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%Number of seconds to skip from the beginning of the file%%%
seconds_to_skip = 100;
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

% All data is 16 bit unsigned int store in little indian format

input_fd = fopen(file_name,'r','l');

% Each data block is preceeded by a packet header
% read first header and data packet to calculate offset
[Header,count] = fread(input_fd,20,'ushort');

sample_rate = Header(11);
update_rate = Header(12);
block_size=sample_rate/update_rate;
[temp,count] = fread(input_fd,[8,block_size],'short');

bytes_per_block = (((Header(11)*Header(16))/Header(12))*2)+40;
fseek(input_fd,bytes_per_block*seconds_to_skip*Header(12),-1);
```

```
% loop through file extracting the data and stripping of packet headers
data=[];
for j=1:number_of_seconds*update_rate

   % Grab next header

  [Header,count] = fread(input_fd,20,'ushort');

  % Extract current gain values for packet The gains are stored in the low byte
  % with the top nibble containing the gain value for the low channel group (1-4)
  % and the low nibble used for the high channels. The gain values stored are
  % converted to real values via the gain lookup vector
  % Check to see if gain is valid if not set gain to one and tell user
  if Header(13) == 255
     gain_channel_1to4 = 1;
     gain_channel_5to8 = 1;
     fprintf(1,'Gain not set in data file');
  else
    gain_channel_1to4 = gain_vector(bitshift(bitand(Header(13),hex2dec('000000f0')),-4)+1);
    gain_channel_5to8 = gain_vector(bitand(Header(13),hex2dec('0000000f'))+1);
  end
  % All of the data is read in as a two dimensional array with the row
  % count set to the number of channels (8) and duration of 1 sec
  % This leaves column equal to the sample rate the sample rate is the last entry in the header
  clear temp
  [temp,count] = fread(input_fd,[8,block_size],'short');
  temp(1:4,:) = temp(1:4,:)./gain_channel_1to4;
  temp(5:8,:) = temp(5:8,:)./gain_channel_5to8;
   j
   %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
   % data = [data,temp(2,:)]; % store only the desginated channel (e.g., channel 2)
   data = [data,temp]; % store 8 channels
   %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
end

%convert to voltage full scall is +/- 5 volts
data = (data .*5.0)/2^15;

fclose(input_fd)
```

Appendix D. Matlab Data Files on Distribution Compact Disk (CD)

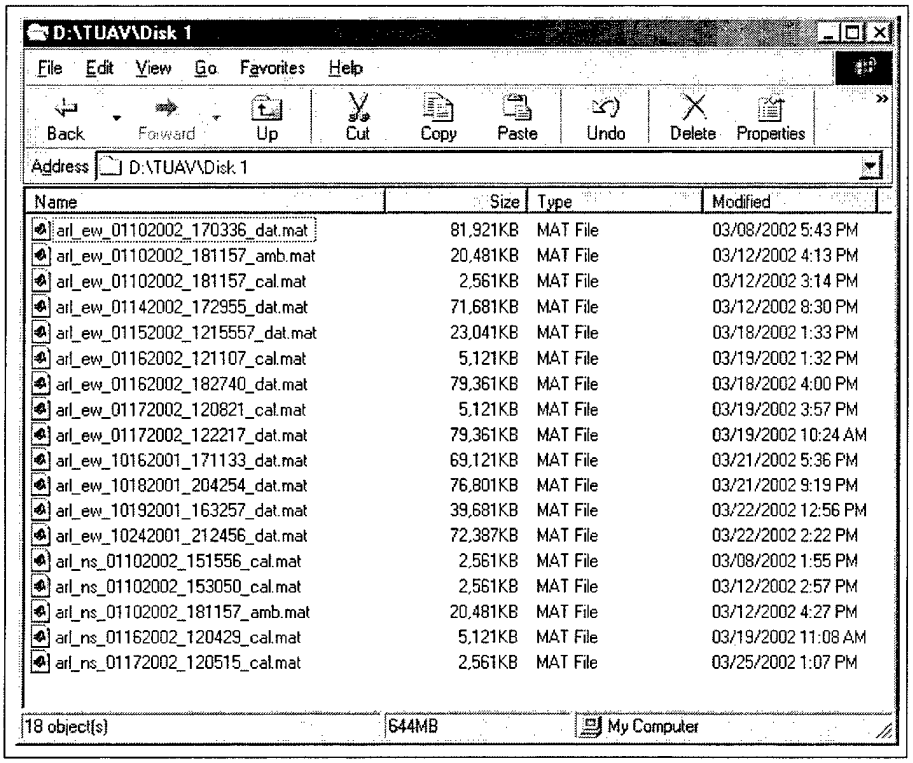


Figure D-1. List of files on CD no. 1.

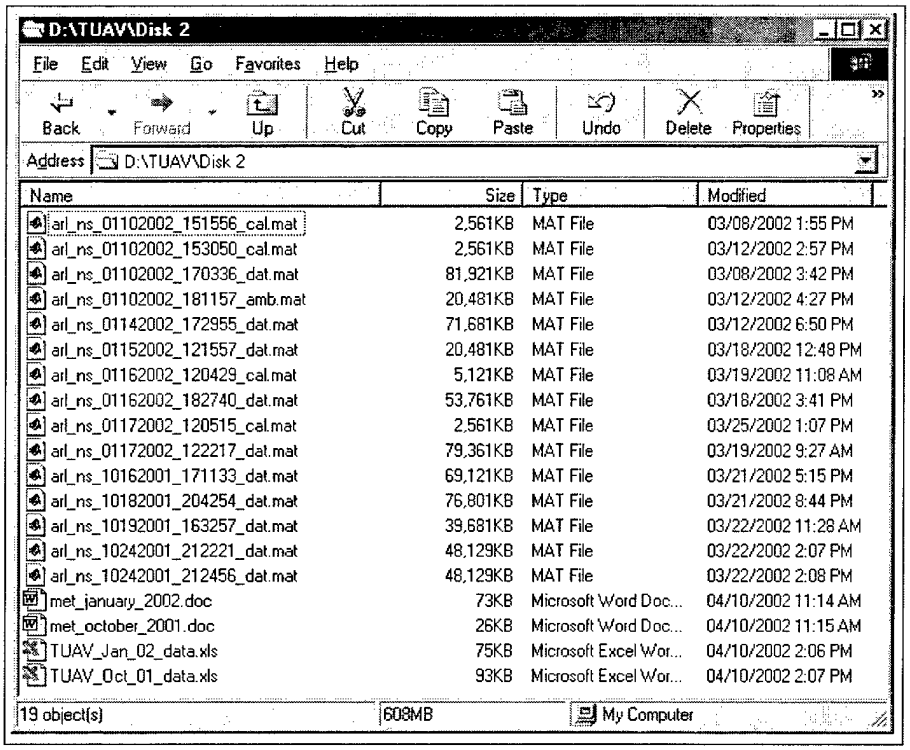
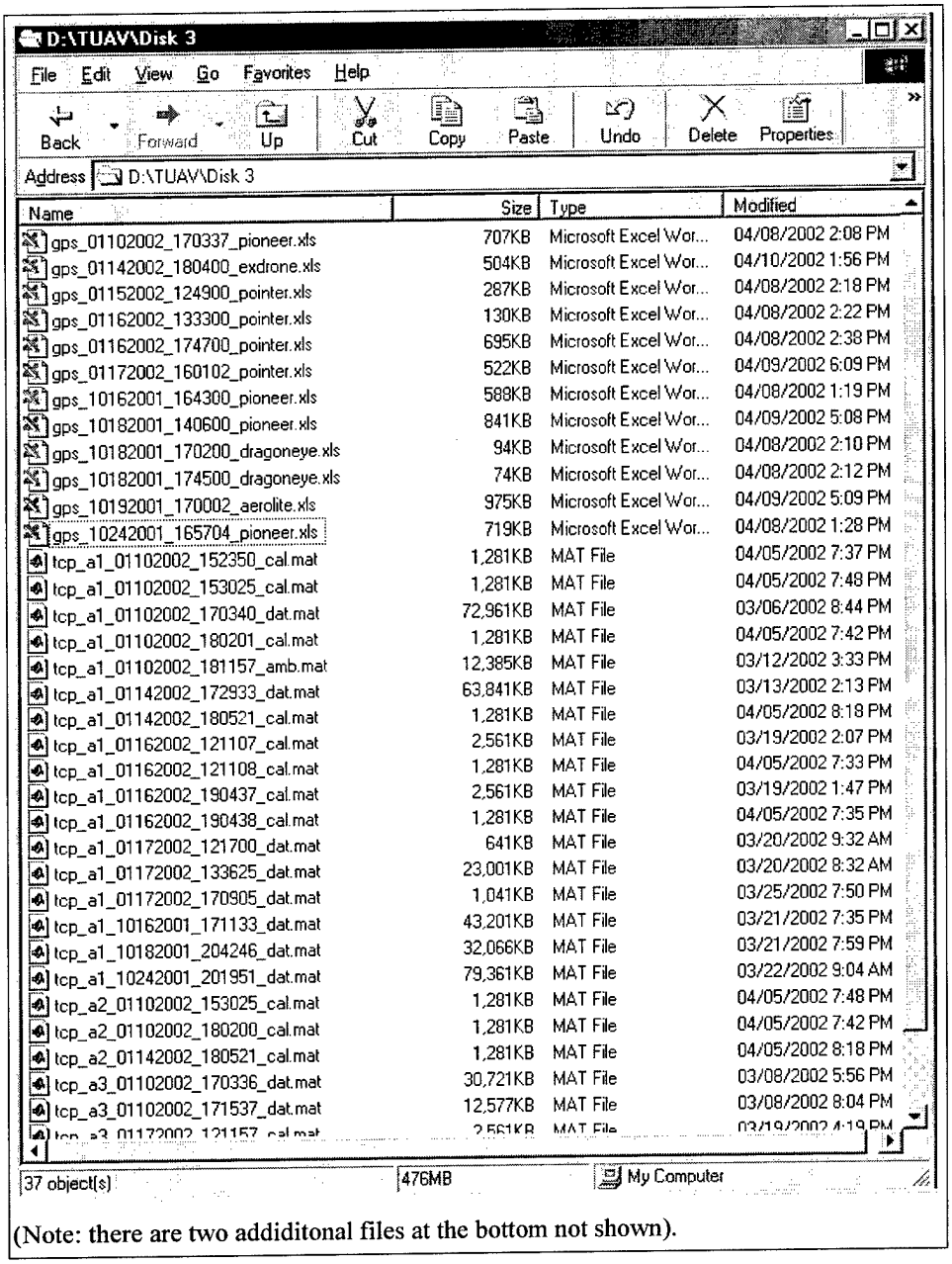


Figure D-2. List of files on CD no. 2.



(Note: there are two addiditonal files at the bottom not shown).

Figure D-3. List of files on CD no. 3.

Appendix E. Test Flight Data for TUAV_Oct_01_Data

Knowles & B&K MICROPHONES							
Filename	**GPS Time (UTM)**	**UAV**	**Altitude**	**Speed**	**Set Conditions**	**Calibration**	**Comments**
Test Date: 10/16/2001							
2001_10_16_16_43_31_sens3_grp0.dat	164331	Pioneer	800 ft	6300RPM	Junction Box: 1 gain: 100		Wind: 15 Knots, Take off
2001_10_16_16_43_31_sens3_grp1.dat	164331	Pioneer	800 ft	6300RPM	Junction Box: 2 gain: 100		Wind: 15 Knots, Take off
2001_10_16_16_43_31_sens3_grp2.dat	164331	Pioneer	800 ft	6300RPM	Junction Box: 3 gain: 100		Wind: 15 Knots, Take off
2001_10_16_16_43_31_sens3_grp3.dat	164331	Pioneer	800 ft	6300RPM	Junction Box: 4 gain: 100		Wind: 15 Knots, Take off
2001_10_16_16_45_41_sens3_grp0.dat	164541	Pioneer	800 ft	6300RPM	Junction Box: 1 gain: 100		N to S
2001_10_16_16_45_41_sens3_grp1.dat	164541	Pioneer	800 ft	6300RPM	Junction Box: 2 gain: 100		N to S
2001_10_16_16_45_41_sens3_grp2.dat	164541	Pioneer	800 ft	6300RPM	Junction Box: 3 gain: 100		N to S
2001_10_16_16_45_41_sens3_grp3.dat	164541	Pioneer	800 ft	6300RPM	Junction Box: 4 gain: 100		N to S
2001_10_16_16_54_21_sens3_grp0.dat	165421	Pioneer	800 ft	6300RPM	Junction Box: 1 gain: 100		S to N/Jet Engine noise
2001_10_16_16_54_21_sens3_grp1.dat	165421	Pioneer	800 ft	6300RPM	Junction Box: 2 gain: 100		S to N/Jet Engine noise
2001_10_16_16_54_21_sens3_grp2.dat	165421	Pioneer	800 ft	6300RPM	Junction Box: 3 gain: 100		S to N/Jet Engine noise
2001_10_16_16_54_21_sens3_grp3.dat	165421	Pioneer	800 ft	6300RPM	Junction Box: 4 gain: 100		S to N/Jet Engine noise
2001_10_16_16_57_15_sens3_grp0.dat	165715	Pioneer	800 ft	6300RPM	Junction Box: 1 gain: 100		E to W/tractor noise
2001_10_16_16_57_15_sens3_grp1.dat	165715	Pioneer	800 ft	6300RPM	Junction Box: 2 gain: 100		E to W/tractor noise
2001_10_16_16_57_15_sens3_grp2.dat	165715	Pioneer	800 ft	6300RPM	Junction Box: 3 gain: 100		E to W/tractor noise
2001_10_16_16_57_15_sens3_grp3.dat	165715	Pioneer	800 ft	6300RPM	Junction Box: 4 gain: 100		E to W/tractor noise
2001_10_16_17_11_19_sens3_grp0.dat	171119	Pioneer	800 ft	6300RPM	Junction Box: 1 gain: 100		W to E
2001_10_16_17_11_19_sens3_grp1.dat	171119	Pioneer	800 ft	6300RPM	Junction Box: 2 gain: 100		W to E
2001_10_16_17_11_19_sens3_grp2.dat	171119	Pioneer	800 ft	6300RPM	Junction Box: 3 gain: 100		W to E
2001_10_16_17_11_19_sens3_grp3.dat	171119	Pioneer	800 ft	6300RPM	Junction Box: 4 gain: 100		W to E
2001_10_16_17_17_33_sens3_grp0.dat	171733	Pioneer	800 ft	7600RPM	Junction Box: 1 gain: 100		N to S
2001_10_16_17_17_33_sens3_grp1.dat	171733	Pioneer	800 ft	7600RPM	Junction Box: 2 gain: 100		N to S
2001_10_16_17_17_33_sens3_grp2.dat	171733	Pioneer	800 ft	7600RPM	Junction Box: 3 gain: 100		N to S
2001_10_16_17_17_33_sens3_grp3.dat	171733	Pioneer	800 ft	7600RPM	Junction Box: 4 gain: 100		N to S
2001_10_16_17_18_42_sens3_grp0.dat	171842	Pioneer	800 ft	7600RPM	Junction Box: 1 gain: 100		S to N
2001_10_16_17_18_42_sens3_grp1.dat	171842	Pioneer	800 ft	7600RPM	Junction Box: 2 gain: 100		S to N
2001_10_16_17_18_42_sens3_grp2.dat	171842	Pioneer	800 ft	7600RPM	Junction Box: 3 gain: 100		S to N

Filename	GPS Time (UTM)	UAV	Altitude	Speed	Set Conditions	Calibration	Comments
2001_10_16_17_18_42_sens3_grp3.dat	171842	Pioneer	800 ft	7600RPM	Junction Box: 4 gain: 100		S to N
2001_10_16_17_11_49_sens3_grp0.dat	171149	Pioneer	800 ft	7600RPM	Junction Box: 1 gain: 100		E to W/Jet Engine noise
2001_10_16_17_11_49_sens3_grp1.dat	171149	Pioneer	800 ft	7600RPM	Junction Box: 2 gain: 100		E to W/Jet Engine noise
2001_10_16_17_11_49_sens3_grp2.dat	171149	Pioneer	800 ft	7600RPM	Junction Box: 3 gain: 100		E to W/Jet Engine noise
2001_10_16_17_11_49_sens3_grp3.dat	171149	Pioneer	800 ft	7600RPM	Junction Box: 4 gain: 100		E to W/Jet Engine noise
2001_10_16_17_17_11_sens3_grp0.dat	171711	Pioneer	2500 ft	6100RPM	Junction Box: 1 gain: 100		N to S
2001_10_16_17_17_11_sens3_grp1.dat	171711	Pioneer	2500 ft	6100RPM	Junction Box: 2 gain: 100		N to S
2001_10_16_17_17_11_sens3_grp2.dat	171711	Pioneer	2500 ft	6100RPM	Junction Box: 3 gain: 100		N to S
2001_10_16_17_17_11_sens3_grp3.dat	171711	Pioneer	2500 ft	6100RPM	Junction Box: 4 gain: 100		N to S
2001_10_16_17_18_31_sens3_grp0.dat	171831	Pioneer	2500 ft	6100RPM	Junction Box: 1 gain: 100		W to E
2001_10_16_17_18_31_sens3_grp1.dat	171831	Pioneer	2500 ft	6100RPM	Junction Box: 2 gain: 100		W to E
2001_10_16_17_18_31_sens3_grp2.dat	171831	Pioneer	2500 ft	6100RPM	Junction Box: 3 gain: 100		W to E
2001_10_16_17_18_31_sens3_grp3.dat	171831	Pioneer	2500 ft	6100RPM	Junction Box: 4 gain: 100		W to E
2001_10_16_17_23_18_sens3_grp0.dat	172318	Pioneer	2500 ft	7600RPM	Junction Box: 1 gain: 100		N to S/tractor noise
2001_10_16_17_23_18_sens3_grp1.dat	172318	Pioneer	2500 ft	7600RPM	Junction Box: 2 gain: 100		N to S/tractor noise
2001_10_16_17_23_18_sens3_grp2.dat	172318	Pioneer	2500 ft	7600RPM	Junction Box: 3 gain: 100		N to S/tractor noise
2001_10_16_17_23_18_sens3_grp3.dat	172318	Pioneer	2500 ft	7600RPM	Junction Box: 4 gain: 100		N to S/tractor noise
2001_10_16_17_28_15_sens3_grp0.dat	172815	Pioneer	2500 ft	7600RPM	Junction Box: 1 gain: 100		S to N
2001_10_16_17_28_15_sens3_grp1.dat	172815	Pioneer	2500 ft	7600RPM	Junction Box: 2 gain: 100		S to N
2001_10_16_17_28_15_sens3_grp2.dat	172815	Pioneer	2500 ft	7600RPM	Junction Box: 3 gain: 100		S to N
2001_10_16_17_28_15_sens3_grp3.dat	172815	Pioneer	2500 ft	7600RPM	Junction Box: 4 gain: 100		S to N
2001_10_16_17_33_19_sens3_grp0.dat	173319	Pioneer	2500 ft	7600RPM	Junction Box: 1 gain: 100		N to S to center field
2001_10_16_17_33_19_sens3_grp1.dat	173319	Pioneer	2500 ft	7600RPM	Junction Box: 2 gain: 100		N to S to center field
2001_10_16_17_33_19_sens3_grp2.dat	173319	Pioneer	2500 ft	7600RPM	Junction Box: 3 gain: 100		N to S to center field
2001_10_16_17_33_19_sens3_grp3.dat	173319	Pioneer	2500 ft	7600RPM	Junction Box: 4 gain: 100		N to S to center field
2001_10_16_17_39_11_sens3_grp0.dat	173911	Pioneer	2500 ft	6300RPM	Junction Box: 1 gain: 100		W to E/tractor noise
2001_10_16_17_39_11_sens3_grp1.dat	173911	Pioneer	2500 ft	6300RPM	Junction Box: 2 gain: 100		W to E/tractor noise
2001_10_16_17_39_11_sens3_grp2.dat	173911	Pioneer	2500 ft	6300RPM	Junction Box: 3 gain: 100		W to E/tractor noise
2001_10_16_17_39_11_sens3_grp3.dat	173911	Pioneer	2500 ft	6300RPM	Junction Box: 4 gain: 100		W to E/tractor noise

Filename	GPS Time (UTM)	UAV	Altitude	Speed	Set Conditions	Calibration	Comments
2001_10_16_17_43_31_sens3_grp0.dat	174331	Pioneer	2500 ft	7600RPM	Junction Box: 1 gain: 100		E to W
2001_10_16_17_43_31_sens3_grp1.dat	174331	Pioneer	2500 ft	7600RPM	Junction Box: 2 gain: 100		E to W
2001_10_16_17_43_31_sens3_grp2.dat	174331	Pioneer	2500 ft	7600RPM	Junction Box: 3 gain: 100		E to W
2001_10_16_17_43_31_sens3_grp3.dat	174331	Pioneer	2500 ft	7600RPM	Junction Box: 4 gain: 100		E to W
2001_10_16_17_47_31_sens3_grp0.dat	174731	Pioneer	climbing	7600RPM	Junction Box: 1 gain: 100		climbing
2001_10_16_17_47_31_sens3_grp1.dat	174731	Pioneer	climbing	7600RPM	Junction Box: 2 gain: 100		climbing
2001_10_16_17_47_31_sens3_grp2.dat	174731	Pioneer	climbing	7600RPM	Junction Box: 3 gain: 100		climbing
2001_10_16_17_47_31_sens3_grp3.dat	174731	Pioneer	climbing	7600RPM	Junction Box: 4 gain: 100		climbing
2001_10_16_17_49_55_sens3_grp0.dat	174955	Pioneer	4800 ft	7100RPM	Junction Box: 1 gain: 100		N to S/17 Knots
2001_10_16_17_49_55_sens3_grp1.dat	174955	Pioneer	4800 ft	7100RPM	Junction Box: 2 gain: 100		N to S/17 Knots
2001_10_16_17_49_55_sens3_grp2.dat	174955	Pioneer	4800 ft	7100RPM	Junction Box: 3 gain: 100		N to S/17 Knots
2001_10_16_17_49_55_sens3_grp3.dat	174955	Pioneer	4800 ft	7100RPM	Junction Box: 4 gain: 100		N to S/17 Knots
2001_10_16_18_11_25_sens3_grp0.dat	181125	Pioneer	4800 ft	7100RPM	Junction Box: 1 gain: 100		S to N/Landing/tractor
2001_10_16_18_11_25_sens3_grp1.dat	181125	Pioneer	4800 ft	7100RPM	Junction Box: 2 gain: 100		S to N/Landing/tractor
2001_10_16_18_11_25_sens3_grp2.dat	181125	Pioneer	4800 ft	7100RPM	Junction Box: 3 gain: 100		S to N/Landing/tractor
2001_10_16_18_11_25_sens3_grp3.dat	181125	Pioneer	4800 ft	7100RPM	Junction Box: 4 gain: 100		S to N/Landing/tractor
Test Date: 10/18/2001							
2001_10_18_15_42_31_sens7_grp0.dat	154231	N/A	N/A		Junction Box: 1 gain: 100	yes	ARL sensor-N-S
2001_10_18_15_46_57_sens7_grp1.dat	154657	N/A	N/A		Junction Box: 2 gain: 100	yes	ARL sensor-E-W
2001_01_18_15_52_55_sens6_grp0.dat	155255	N/A	N/A		Junction Box: 1 gain: 100	yes	Mic 2,1,3,5
2001_10_18_16_05_55_sens7_grp0.dat	161555	Pioneer			Junction Box: 1 gain: 100		
2001_10_18_16_05_55_sens7_grp1.dat	161555	Pioneer			Junction Box: 2 gain: 100		
2001_01_18_16_05_36_sens6_grp0.dat	161536	Pioneer			Junction Box: 1 gain: 100		
2001_10_18_16_13_34_sens7_grp0.dat	161334	Pioneer			Junction Box: 1 gain: 100		S to N/Touch and Go/wind 8 Knots
2001_10_18_16_13_34_sens7_grp1.dat	161334	Pioneer			Junction Box: 2 gain: 100		S to N/Touch and Go/wind 8 Knots
2001_01_18_16_11_11_sens6_grp0.dat	161111	Pioneer			Junction Box: 1 gain: 100		S to N/Touch and Go/wind 8 Knots
2001_10_18_16_17_41_sens7_grp0.dat	161741	Pioneer			Junction Box: 1 gain: 100		S to N/Touch and Go
2001_10_18_16_17_41_sens7_grp1.dat	161741	Pioneer			Junction Box: 2 gain: 100		S to N/Touch and Go
2001_01_18_16_15_24_sens6_grp0.dat	161524	Pioneer			Junction Box: 1 gain: 100		S to N/Touch and Go

Filename	GPS Time (UTM)	UAV	Altitude	Speed	Set Conditions	Calibration	Comments
2001_10_18_16_20_55_sens7_grp0.dat	162055	Pioneer			Junction Box: 1 gain: 100		S to N/Touch and Go
2001_10_18_16_20_55_sens7_grp1.dat	162055	Pioneer			Junction Box: 2 gain: 100		S to N/Touch and Go
2001_01_18_16_20_30_sens6_grp0.dat	162030	Pioneer			Junction Box: 1 gain: 100		S to N/Touch and Go
2001_10_18_17_01_47_sens7_grp0.dat	170147	Dragoneye			Junction Box: 1 gain: 100		Electric motor/wind 8 Knots
2001_10_18_17_01_47_sens7_grp1.dat	170147	Dragoneye			Junction Box: 2 gain: 100		Electric motor
2001_01_18_17_01_36_sens6_grp0.dat	170136	Dragoneye			Junction Box: 1 gain: 100		Electric motor
2001_10_18_17_02_50_sens7_grp0.dat	170250	Dragoneye	400 ft		Junction Box: 1 gain: 1000		Electric motor
2001_10_18_17_02_50_sens7_grp1.dat	170250	Dragoneye	400 ft		Junction Box: 2 gain: 1000		Electric motor
2001_01_18_17_05_12_sens6_grp0.dat	170212	Dragoneye	400 ft		Junction Box: 1 gain: 1000		Electric motor
2001_10_18_17_06_04_sens7_grp0.dat	170604	Dragoneye	400 ft		Junction Box: 1 gain: 1000		Electric motor
2001_10_18_17_06_04_sens7_grp1.dat	170604	Dragoneye	400 ft		Junction Box: 2 gain: 1000		Electric motor
2001_01_18_17_06_01_sens6_grp0.dat	170601	Dragoneye	400 ft		Junction Box: 1 gain: 1000		Electric motor
2001_10_18_17_12_46_sens7_grp0.dat	171246	Dragoneye	300 ft		Junction Box: 1 gain: 1000		Electric motor
2001_10_18_17_12_46_sens7_grp1.dat	171246	Dragoneye	300 ft		Junction Box: 2 gain: 1000		Electric motor
2001_01_18_17_12_35_sens6_grp0.dat	171235	Dragoneye	300 ft		Junction Box: 1 gain: 1000		Electric motor
2001_10_18_17_14_22_sens7_grp0.dat	171422	Dragoneye	200 ft		Junction Box: 1 gain: 1000		Electric motor
2001_10_18_17_14_22_sens7_grp1.dat	171422	Dragoneye	200 ft		Junction Box: 2 gain: 1000		Electric motor
2001_01_18_17_14_12_sens6_grp0.dat	171412	Dragoneye	200 ft		Junction Box: 1 gain: 1000		Electric motor
2001_10_18_17_16_48_sens7_grp0.dat	171648	Dragoneye	200 ft		Junction Box: 1 gain: 1000		Electric motor
2001_10_18_17_16_48_sens7_grp1.dat	171648	Dragoneye	200 ft		Junction Box: 2 gain: 1000		Electric motor
2001_01_18_17_16_40_sens6_grp0.dat	171640	Dragoneye	200 ft		Junction Box: 1 gain: 1000		Electric motor
2001_10_18_17_44_03_sens7_grp0.dat	174403	Dragoneye	200 ft		Junction Box: 1 gain: 1000		Electric motor
2001_10_18_17_44_03_sens7_grp1.dat	174403	Dragoneye	200 ft		Junction Box: 2 gain: 1000		Electric motor
2001_01_18_17_43_52_sens6_grp0.dat	174352	Dragoneye	200 ft		Junction Box: 1 gain: 1000		Electric motor
2001_10_18_17_48_41_sens7_grp0.dat	174841	Dragoneye	200 ft		Junction Box: 1 gain: 1000		Electric motor
2001_10_18_17_48_41_sens7_grp1.dat	174841	Dragoneye	200 ft		Junction Box: 2 gain: 1000		Electric motor
2001_01_18_17_48_31_sens6_grp0.dat	174831	Dragoneye	200 ft		Junction Box: 1 gain: 1000		Electric motor
2001_10_18_17_50_33_sens7_grp0.dat	175033	Dragoneye	200 ft		Junction Box: 1 gain: 1000		Electric motor
2001_10_18_17_50_33_sens7_grp1.dat	175033	Dragoneye	200 ft		Junction Box: 2 gain: 1000		Electric motor

Filename	GPS Time (UTM)	UAV	Altitude	Speed	Set Conditions	Calibration	Comments
2001_01_18_17_50_27_sens6_grp0.dat	175027	Dragoneye	200 ft		Junction Box: 1 gain: 1000		Electric motor
2001_10_18_19_52_36_sens7_grp0.dat	195236	N/A	N/A		Junction Box: 1 gain: 1000	yes	ARL sensor-N-S
2001_10_18_19_56_11_sens7_grp1.dat	195611	N/A	N/A		Junction Box: 2 gain: 1000	yes	ARL sensor-E-W
2001_01_18_20_00_25_sens6_grp0.dat	200025	N/A	N/A		Junction Box: 1 gain: 1000	yes	Mic 2,1,3,5
2001_10_18_20_41_19_sens7_grp0.dat	204119	Aerolite	1000 ft	6100RPM	Junction Box: 1 gain: 100		E to W, 65 Knots
2001_10_18_20_41_19_sens7_grp1.dat	204119	Aerolite	1000 ft	6100RPM	Junction Box: 2 gain: 100		E to W, 65 Knots
2001_01_18_20_41_03_sens6_grp0.dat	205103	Aerolite	1000 ft	6100RPM	Junction Box: 1 gain: 100		E to W, 65 Knots
2001_10_18_20_50_39_sens7_grp0.dat	205039	Aerolite	1000 ft	7100RPMRPM	Junction Box: 1 gain: 100		E to W, 65 Knots
2001_10_18_20_50_39_sens7_grp1.dat	205039	Aerolite	1000 ft	7100RPMRPM	Junction Box: 2 gain: 100		E to W, 65 Knots
2001_01_18_20_50_34_sens6_grp0.dat	205034	Aerolite	1000 ft	7100RPMRPM	Junction Box: 1 gain: 100		E to W, 65 Knots
2001_10_18_20_55_05_sens7_grp0.dat	205505	Aerolite	1000 ft	7100RPMRPM	Junction Box: 1 gain: 100		W to E, 81 Knots
2001_10_18_20_55_05_sens7_grp1.dat	205505	Aerolite	1000 ft	7100RPMRPM	Junction Box: 2 gain: 100		W to E, 81 Knots
2001_01_18_20_54_54_sens6_grp0.dat	205454	Aerolite	1000 ft	7100RPMRPM	Junction Box: 1 gain: 100		W to E, 81 Knots
2001_10_18_20_58_00_sens7_grp0.dat	205800	Aerolite	1000 ft	6100RPM	Junction Box: 1 gain: 100		N to S, 61 Knots
2001_10_18_20_58_00_sens7_grp1.dat	205800	Aerolite	1000 ft	6100RPM	Junction Box: 2 gain: 100		N to S, 61 Knots
2001_01_18_20_57_50_sens6_grp0.dat	205750	Aerolite	1000 ft	6100RPM	Junction Box: 1 gain: 100		N to S, 61 Knots
2001_10_18_21_02_49_sens7_grp0.dat	210249	Aerolite	1000 ft	7000RPM	Junction Box: 1 gain: 100		S to N, 80 Knots
2001_10_18_21_02_49_sens7_grp1.dat	210249	Aerolite	1000 ft	7000RPM	Junction Box: 2 gain: 100		S to N, 80 Knots
2001_01_18_21_02_40_sens6_grp0.dat	210240	Aerolite	1000 ft	7000RPM	Junction Box: 1 gain: 100		S to N, 80 Knots
2001_10_18_21_06_28_sens7_grp0.dat	210628	Aerolite	2500 ft	6100RPM	Junction Box: 1 gain: 100		E to W, 65 Knots
2001_10_18_21_06_28_sens7_grp1.dat	210628	Aerolite	2500 ft	6100RPM	Junction Box: 2 gain: 100		E to W, 65 knts, 5 knts
2001_01_18_21_06_02_sens6_grp0.dat	210602	Aerolite	2500 ft	6100RPM	Junction Box: 1 gain: 100		E to W, 65 knts, 5 knts
2001_10_18_21_08_10_sens7_grp0.dat	210810	Aerolite	2500 ft	6100RPM	Junction Box: 1 gain: 100		E to W, 65 Knots
2001_10_18_21_08_10_sens7_grp1.dat	210810	Aerolite	2500 ft	6100RPM	Junction Box: 2 gain: 100		E to W, 65 knts, 5 knts
2001_01_18_21_08_01_sens6_grp0.dat	210801	Aerolite	2500 ft	6100RPM	Junction Box: 1 gain: 100		E to W, 65 knts, 5 knts
2001_10_18_21_12_06_sens7_grp0.dat	211206	Aerolite	2500 ft	7100RPM	Junction Box: 1 gain: 100		W to E, 81 Knots
2001_10_18_21_12_06_sens7_grp1.dat	211206	Aerolite	2500 ft	7100RPM	Junction Box: 2 gain: 100		W to E, 81 Knots
2001_01_18_21_11_59_sens6_grp0.dat	211159	Aerolite	2500 ft	7100RPM	Junction Box: 1 gain: 100		W to E, 81 Knots
2001_10_18_21_15_05_sens7_grp0.dat	211505	Aerolite	2500 ft	6100RPM	Junction Box: 1 gain: 100		N to S, 65 Knots

Filename	GPS Time (UTM)	UAV	Altitude	Speed	Set Conditions	Calibration	Comments
2001_10_18_21_15_05_sens7_grp1.dat	211505	Aerolite	2500 ft	6100RPM	Junction Box: 2 gain: 100		N to S, 65 Knots
2001_01_18_21_14_56_sens6_grp0.dat	211456	Aerolite	2500 ft	6100RPM	Junction Box: 1 gain: 100		N to S, 65 Knots
2001_10_18_21_19_35_sens7_grp0.dat	211935	Aerolite	2500 ft	7200RPM	Junction Box: 1 gain: 100		S to N, 80 Knots
2001_10_18_21_19_35_sens7_grp1.dat	211935	Aerolite	2500 ft	7200RPM	Junction Box: 2 gain: 100		S to N, 80 Knots
2001_01_18_21_19_28_sens6_grp0.dat	211928	Aerolite	2500 ft	7200RPM	Junction Box: 1 gain: 100		S to N, 80 Knots
2001_10_18_21_22_33_sens7_grp0.dat	212233	Aerolite	2500 ft	6100RPM	Junction Box: 1 gain: 100		E to W, 65 Knots
2001_10_18_21_22_33_sens7_grp1.dat	212233	Aerolite	2500 ft	6100RPM	Junction Box: 2 gain: 100		E to W, 65 knts, 5 knts
2001_01_18_21_22_25_sens6_grp0.dat	212233	Aerolite	2500 ft	6100RPM	Junction Box: 1 gain: 100		E to W, 65 knts, 5 knts
Test Date: 10/19/2001							
2001_10_19_16_03_22_sens7_grp0.dat	160322	Aerolite	Take off	Various	Junction Box: 1 gain: 100		~ 11 Knots
2001_10_19_16_03_22_sens7_grp1.dat	160322	Aerolite	Take off	Various	Junction Box: 2 gain: 100		~ 11 Knots
2001_01_19_16_03_14_sens6_grp0.dat	160314	Aerolite	Take off	Various	Junction Box: 1 gain: 100		~ 11 Knots
2001_10_19_16_09_15_sens7_grp0.dat	160915	Aerolite	1000 ft	5800RPM	Junction Box: 1 gain: 100		E to W, 65 Knots
2001_10_19_16_09_15_sens7_grp1.dat	160915	Aerolite	1000 ft	5800RPM	Junction Box: 2 gain: 100		E to W, 65 knts
2001_01_19_16_09_05_sens6_grp0.dat	160905	Aerolite	1000 ft	5800RPM	Junction Box: 1 gain: 100		E to W, 65 knts
2001_10_19_16_17_01_sens7_grp0.dat	161701	Aerolite	1000 ft	5600RPM	Junction Box: 1 gain: 100		E to W, 65 Knots
2001_10_19_16_17_01_sens7_grp1.dat	161701	Aerolite	1000 ft	5600RPM	Junction Box: 2 gain: 100		E to W, 65 knts
2001_01_19_16_16_59_sens6_grp0.dat	161659	Aerolite	1000 ft	5600RPM	Junction Box: 1 gain: 100		E to W, 65 knts
2001_10_19_16_21_59_sens7_grp0.dat	162159	Aerolite	1000 ft	7200RPM	Junction Box: 1 gain: 100		W to E, 80 Knots
2001_10_19_16_21_59_sens7_grp1.dat	162159	Aerolite	1000 ft	7200RPM	Junction Box: 2 gain: 100		W to E, 80 Knots
2001_01_19_16_21_54_sens6_grp0.dat	162154	Aerolite	1000 ft	7200RPM	Junction Box: 1 gain: 100		W to E, 80 Knots
2001_10_19_16_24_51_sens7_grp0.dat	162451	Aerolite	1000 ft	5700RPM	Junction Box: 1 gain: 100		N to S, 65 Knots
2001_10_19_16_24_51_sens7_grp1.dat	162451	Aerolite	1000 ft	5700RPM	Junction Box: 2 gain: 100		N to S, 65 Knots
2001_01_19_16_24_47_sens6_grp0.dat	162447	Aerolite	1000 ft	5700RPM	Junction Box: 1 gain: 100		N to S, 65 Knots
2001_10_19_16_30_17_sens7_grp0.dat	163017	Aerolite	1000 ft	7000RPM	Junction Box: 1 gain: 100		S to N, 80 Knots
2001_10_19_16_30_17_sens7_grp1.dat	163017	Aerolite	1000 ft	7000RPM	Junction Box: 2 gain: 100		S to N, 80 Knots
2001_01_19_16_30_13_sens6_grp0.dat	163013	Aerolite	1000 ft	7000RPM	Junction Box: 1 gain: 100		S to N, 80 Knots
2001_10_19_16_32_48_sens7_grp0.dat	163248	Aerolite	1000 ft	5700RPM	Junction Box: 1 gain: 100		E to W, 65 Knots
2001_10_19_16_32_48_sens7_grp1.dat	163248	Aerolite	1000 ft	5700RPM	Junction Box: 2 gain: 100		E to W, 65 knts

Filename	GPS Time (UTM)	UAV	Altitude	Speed	Set Conditions	Calibration	Comments
2001_01_19_16_32_44_sens6_grp0.dat	163244	Aerolite	1000 ft	5700RPM	Junction Box: 1 gain: 100		E to W, 65 knts
2001_10_19_16_36_49_sens7_grp0.dat	163649	Aerolite	1000 ft	7100RPM	Junction Box: 1 gain: 100		W to E, 80 Knots
2001_10_19_16_36_49_sens7_grp1.dat	163649	Aerolite	1000 ft	7100RPM	Junction Box: 2 gain: 100		W to E, 80 Knots
2001_01_19_16_36_45_sens6_grp0.dat	163645	Aerolite	1000 ft	7100RPM	Junction Box: 1 gain: 100		W to E, 80 Knots
2001_10_19_16_39_56_sens7_grp0.dat	163956	Aerolite	climbing	7100RPM	Junction Box: 1 gain: 100		climbing
2001_10_19_16_39_56_sens7_grp1.dat	163956	Aerolite	climbing	7100RPM	Junction Box: 2 gain: 100		climbing
2001_01_19_16_39_47_sens6_grp0.dat	163947	Aerolite	climbing	7100RPM	Junction Box: 1 gain: 100		climbing
2001_10_19_16_41_40_sens7_grp0.dat	164140	Aerolite	2500 ft	6100RPM	Junction Box: 1 gain: 100		E to W, 65 Knots
2001_10_19_16_41_40_sens7_grp1.dat	164140	Aerolite	2500 ft	6100RPM	Junction Box: 2 gain: 100		E to W, 65 knts
2001_01_19_16_41_35_sens6_grp0.dat	164135	Aerolite	2500 ft	6100RPM	Junction Box: 1 gain: 100		E to W, 65 knts
2001_10_19_16_44_55_sens7_grp0.dat	164455	Aerolite	2500 ft	7100RPM	Junction Box: 1 gain: 100		W to E, 80 Knots
2001_10_19_16_44_55_sens7_grp1.dat	164455	Aerolite	2500 ft	7100RPM	Junction Box: 2 gain: 100		W to E, 80 Knots
2001_01_19_16_44_49_sens6_grp0.dat	164449	Aerolite	2500 ft	7100RPM	Junction Box: 1 gain: 100		W to E, 80 Knots
2001_10_19_16_47_53_sens7_grp0.dat	164753	Aerolite	2500 ft	5800RPM	Junction Box: 1 gain: 100		N to S, 65 Knots
2001_10_19_16_47_53_sens7_grp1.dat	164753	Aerolite	2500 ft	5800RPM	Junction Box: 2 gain: 100		N to S, 65 Knots
2001_01_19_16_47_47_sens6_grp0.dat	164747	Aerolite	2500 ft	5800RPM	Junction Box: 1 gain: 100		N to S, 65 Knots
2001_10_19_16_53_12_sens7_grp0.dat	165312	Aerolite	2500 ft	7100RPM	Junction Box: 1 gain: 100		S to N, 80 Knots
2001_10_19_16_53_12_sens7_grp1.dat	165312	Aerolite	2500 ft	7100RPM	Junction Box: 2 gain: 100		S to N, 80 Knots
2001_01_19_16_53_09_sens6_grp0.dat	165309	Aerolite	2500 ft	7100RPM	Junction Box: 1 gain: 100		S to N, 80 Knots
Test Date: 10/24/2001							
2001_10_24_16_51_39_sens6_grp0.dat	165139	Pioneer	800 ft	6240RPM	Junction Box: 1 gain: 100		W to E, Generator, 70 Knots
2001_10_24_16_51_39_sens6_grp1.dat	165139	Pioneer	800 ft	6240RPM	Junction Box: 2 gain: 100		W to E, Generator, 70 Knots
2001_01_24_16_51_30_sens7_grp0.dat	165130	Pioneer	800 ft	6240RPM	Junction Box: 1 gain: 100		W to E, Generator, 70 Knots
2001_01_24_16_51_30_sens7_grp1.dat	165130	Pioneer	800 ft	6240RPM	Junction Box: 2 gain: 100		W to E, Generator, 70 Knots
2001_01_24_16_51_30_sens7_grp3.dat	165130	Pioneer	800 ft	6240RPM	Junction Box: 3 gain: 100		W to E, Generator, 70 Knots
2001_10_24_17_04_09_sens6_grp0.dat	170409	Pioneer	800 ft	7440RPM	Junction Box: 1 gain: 100		E to W, Generator, 90 Knots
2001_10_24_17_04_09_sens6_grp1.dat	170409	Pioneer	800 ft	7440RPM	Junction Box: 2 gain: 100		E to W, Generator, 90 Knots
2001_01_24_17_04_03_sens7_grp0.dat	170403	Pioneer	800 ft	7440RPM	Junction Box: 1 gain: 100		E to W, Generator, 90 Knots
2001_01_24_17_04_03_sens7_grp1.dat	170403	Pioneer	800 ft	7440RPM	Junction Box: 2 gain: 100		E to W, Generator, 90 Knots

Filename	GPS Time (UTM)	UAV	Altitude	Speed	Set Conditions	Calibration	Comments
2001_01_24_17_04_03_sens7_grp3.dat	170403	Pioneer	800 ft	7440RPM	Junction Box: 3 gain: 100		E to W, Generator, 90 Knots
2001_10_24_17_06_20_sens6_grp0.dat	170620	Pioneer	800 ft	6160RPM	Junction Box: 1 gain: 100		S to N, Generator, 70 Knots
2001_10_24_17_06_20_sens6_grp1.dat	170620	Pioneer	800 ft	6160RPM	Junction Box: 2 gain: 100		S to N, Generator, 70 Knots
2001_01_24_17_06_10_sens7_grp0.dat	170610	Pioneer	800 ft	6160RPM	Junction Box: 1 gain: 100		S to N, Generator, 70 Knots
2001_01_24_17_06_10_sens7_grp1.dat	170610	Pioneer	800 ft	6160RPM	Junction Box: 2 gain: 100		S to N, Generator, 70 Knots
2001_01_24_17_06_10_sens7_grp3.dat	170610	Pioneer	800 ft	6160RPM	Junction Box: 3 gain: 100		S to N, Generator, 70 Knots
2001_10_24_17_11_26_sens6_grp0.dat	171126	Pioneer	800 ft	7280RPM	Junction Box: 1 gain: 100		N to S, Generator, 90 Knots
2001_10_24_17_11_26_sens6_grp1.dat	171126	Pioneer	800 ft	7280RPM	Junction Box: 2 gain: 100		N to S, Generator, 90 Knots
2001_01_24_17_11_22_sens7_grp0.dat	171122	Pioneer	800 ft	7280RPM	Junction Box: 1 gain: 100		N to S, Generator, 90 Knots
2001_01_24_17_11_22_sens7_grp1.dat	171122	Pioneer	800 ft	7280RPM	Junction Box: 2 gain: 100		N to S, Generator, 90 Knots
2001_01_24_17_11_22_sens7_grp3.dat	171122	Pioneer	800 ft	7280RPM	Junction Box: 3 gain: 100		N to S, Generator, 90 Knots
2001_10_24_17_23_00_sens6_grp0.dat	172300	Pioneer	T&G		Junction Box: 1 gain: 100		Touch and Go near sensor
2001_10_24_17_23_00_sens6_grp1.dat	172300	Pioneer	T&G		Junction Box: 2 gain: 100		Touch and Go near sensor
2001_01_24_17_22_56_sens7_grp0.dat	172256	Pioneer	T&G		Junction Box: 1 gain: 100		Touch and Go near sensor
2001_01_24_17_22_56_sens7_grp1.dat	172256	Pioneer	T&G		Junction Box: 2 gain: 100		Touch and Go near sensor
2001_01_24_17_22_56_sens7_grp3.dat	172256	Pioneer	T&G		Junction Box: 3 gain: 100		Touch and Go near sensor
2001_10_24_17_29_36_sens6_grp0.dat	172936	Pioneer	2500 ft	6100RPM	Junction Box: 1 gain: 100		S to N, 70 Knots
2001_10_24_17_29_36_sens6_grp1.dat	172936	Pioneer	2500 ft	6100RPM	Junction Box: 2 gain: 100		S to N, 70 Knots
2001_01_24_17_29_28_sens7_grp0.dat	172928	Pioneer	2500 ft	6100RPM	Junction Box: 1 gain: 100		S to N, 70 Knots
2001_01_24_17_29_28_sens7_grp1.dat	172928	Pioneer	2500 ft	6100RPM	Junction Box: 2 gain: 100		S to N, 70 Knots
2001_01_24_17_29_28_sens7_grp3.dat	172928	Pioneer	2500 ft	6100RPM	Junction Box: 3 gain: 100		S to N, 70 Knots
2001_10_24_17_36_35_sens6_grp0.dat	173635	Pioneer	2500 ft	7200RPM	Junction Box: 1 gain: 100		N to S, 90 Knots
2001_10_24_17_36_35_sens6_grp1.dat	173635	Pioneer	2500 ft	7200RPM	Junction Box: 2 gain: 100		N to S, 90 Knots
2001_01_24_17_36_29_sens7_grp0.dat	173629	Pioneer	2500 ft	7200RPM	Junction Box: 1 gain: 100		N to S, 90 Knots
2001_01_24_17_36_29_sens7_grp1.dat	173629	Pioneer	2500 ft	7200RPM	Junction Box: 2 gain: 100		N to S, 90 Knots
2001_01_24_17_36_29_sens7_grp3.dat	173629	Pioneer	2500 ft	7200RPM	Junction Box: 3 gain: 100		N to S, 90 Knots
2001_10_24_17_48_22_sens6_grp0.dat	174822	Pioneer	2500 ft		Junction Box: 1 gain: 100		
2001_10_24_17_48_22_sens6_grp1.dat	174822	Pioneer	2500 ft		Junction Box: 2 gain: 100		
2001_01_24_17_48_19_sens7_grp0.dat	174819	Pioneer	2500 ft		Junction Box: 1 gain: 100		

Filename	GPS Time (UTM)	UAV	Altitude	Speed	Set Conditions	Calibration	Comments
2001_01_24_17_48_19_sens7_grp1.dat	174819	Pioneer	2500 ft		Junction Box: 2 gain: 100		
2001_01_24_17_48_19_sens7_grp3.dat	174819	Pioneer	2500 ft		Junction Box: 3 gain: 100		
2001_10_24_17_57_49_sens6_grp0.dat	175749	Pioneer	2500 ft		Junction Box: 1 gain: 100		
2001_10_24_17_57_49_sens6_grp1.dat	175749	Pioneer	2500 ft		Junction Box: 2 gain: 100		
2001_01_24_17_57_45_sens7_grp0.dat	175745	Pioneer	2500 ft		Junction Box: 1 gain: 100		
2001_01_24_17_57_45_sens7_grp1.dat	175745	Pioneer	2500 ft		Junction Box: 2 gain: 100		
2001_01_24_17_57_45_sens7_grp3.dat	175745	Pioneer	2500 ft		Junction Box: 3 gain: 100		
2001_10_24_18_02_57_sens6_grp0.dat	180257	Pioneer	2500 ft	6300RPM	Junction Box: 1 gain: 100		W to E, 70 Knots
2001_10_24_18_02_57_sens6_grp1.dat	180257	Pioneer	2500 ft	6300RPM	Junction Box: 2 gain: 100		W to E, 70 Knots
2001_01_24_18_02_55_sens7_grp0.dat	180255	Pioneer	2500 ft	6300RPM	Junction Box: 1 gain: 100		W to E, 70 Knots
2001_01_24_18_02_55_sens7_grp1.dat	180255	Pioneer	2500 ft	6300RPM	Junction Box: 2 gain: 100		W to E, 70 Knots
2001_01_24_18_02_55_sens7_grp3.dat	180255	Pioneer	2500 ft	6300RPM	Junction Box: 3 gain: 100		W to E, 70 Knots
2001_10_24_18_07_27_sens6_grp0.dat	180727	Pioneer	2500 ft	7400RPM	Junction Box: 1 gain: 100		E to W, 90 Knots
2001_10_24_18_07_27_sens6_grp1.dat	180727	Pioneer	2500 ft	7400RPM	Junction Box: 2 gain: 100		E to W, 90 Knots
2001_01_24_18_07_22_sens7_grp0.dat	180722	Pioneer	2500 ft	7400RPM	Junction Box: 1 gain: 100		E to W, 90 Knots
2001_01_24_18_07_22_sens7_grp1.dat	180722	Pioneer	2500 ft	7400RPM	Junction Box: 2 gain: 100		E to W, 90 Knots
2001_01_24_18_07_22_sens7_grp3.dat	180722	Pioneer	2500 ft	7400RPM	Junction Box: 3 gain: 100		E to W, 90 Knots
2001_10_24_19_59_52_sens6_grp0.dat	195952	Pioneer	800 ft	6000RPM	Junction Box: 1 gain: 100		E to W, Generator, 70 Knots
2001_10_24_19_59_52_sens6_grp1.dat	195952	Pioneer	800 ft	6000RPM	Junction Box: 2 gain: 100		E to W, Generator, 70 Knots
2001_01_24_19_59_42_sens7_grp0.dat	195942	Pioneer	800 ft	6000RPM	Junction Box: 1 gain: 100		E to W, Generator, 70 Knots
2001_01_24_19_59_42_sens7_grp1.dat	195942	Pioneer	800 ft	6000RPM	Junction Box: 2 gain: 100		E to W, Generator, 70 Knots
2001_01_24_19_59_42_sens7_grp3.dat	195942	Pioneer	800 ft	6000RPM	Junction Box: 3 gain: 100		E to W, Generator, 70 Knots
2001_10_24_20_13_13_sens6_grp0.dat	201313	Pioneer	800 ft	7800RPM	Junction Box: 1 gain: 100		W to E, Generator, 90 Knots
2001_10_24_20_13_13_sens6_grp1.dat	201313	Pioneer	800 ft	7800RPM	Junction Box: 2 gain: 100		W to E, Generator, 90 Knots
2001_01_24_20_13_10_sens7_grp0.dat	201310	Pioneer	800 ft	7800RPM	Junction Box: 1 gain: 100		W to E, Generator, 90 Knots
2001_01_24_20_13_10_sens7_grp1.dat	201310	Pioneer	800 ft	7800RPM	Junction Box: 2 gain: 100		W to E, Generator, 90 Knots
2001_01_24_20_13_10_sens7_grp3.dat	201310	Pioneer	800 ft	7800RPM	Junction Box: 3 gain: 100		W to E, Generator, 90 Knots
2001_10_24_20_17_47_sens6_grp0.dat	201747	Pioneer	800 ft		Junction Box: 1 gain: 100		W to E, 90 Knots
2001_10_24_20_17_47_sens6_grp1.dat	201747	Pioneer	800 ft		Junction Box: 2 gain: 100		W to E, 90 Knots

Filename	GPS Time (UTM)	UAV	Altitude	Speed	Set Conditions	Calibration	Comments
2001_01_24_20_17_42_sens7_grp0.dat	201742	Pioneer	800 ft		Junction Box: 1 gain: 100		W to E, 90 Knots
2001_01_24_20_17_42_sens7_grp1.dat	201742	Pioneer	800 ft		Junction Box: 2 gain: 100		W to E, 90 Knots
2001_01_24_20_17_42_sens7_grp3.dat	201742	Pioneer	800 ft		Junction Box: 3 gain: 100		W to E, 90 Knots
2001_10_24_20_19_53_sens6_grp0.dat	201953	Pioneer	800 ft	6400RPM	Junction Box: 1 gain: 100		N to S, 70 Knots
2001_10_24_20_19_53_sens6_grp1.dat	201953	Pioneer	800 ft	6400RPM	Junction Box: 2 gain: 100		N to S, 70 Knots
2001_01_24_20_19_49_sens7_grp0.dat	201949	Pioneer	800 ft	6400RPM	Junction Box: 1 gain: 100		N to S, 70 Knots
2001_01_24_20_19_49_sens7_grp1.dat	201949	Pioneer	800 ft	6400RPM	Junction Box: 2 gain: 100		N to S, 70 Knots
2001_01_24_20_19_49_sens7_grp3.dat	201949	Pioneer	800 ft	6400RPM	Junction Box: 3 gain: 100		N to S, 70 Knots
2001_10_24_20_25_17_sens6_grp0.dat	202517	Pioneer	800 ft	7400RPM	Junction Box: 1 gain: 100		S to N, 90 Knots
2001_10_24_20_25_17_sens6_grp1.dat	201517	Pioneer	800 ft	7400RPM	Junction Box: 2 gain: 100		S to N, 90 Knots
2001_01_24_20_25_12_sens7_grp0.dat	202512	Pioneer	800 ft	7400RPM	Junction Box: 1 gain: 100		S to N, 90 Knots
2001_01_24_20_25_12_sens7_grp1.dat	202512	Pioneer	800 ft	7400RPM	Junction Box: 2 gain: 100		S to N, 90 Knots
2001_01_24_20_25_12_sens7_grp3.dat	202512	Pioneer	800 ft	7400RPM	Junction Box: 3 gain: 100		S to N, 90 Knots
2001_10_24_20_27_53_sens6_grp0.dat	202753	Pioneer	climbing	7400RPM	Junction Box: 1 gain: 100		climbing
2001_10_24_20_27_53_sens6_grp1.dat	202753	Pioneer	climbing	7400RPM	Junction Box: 2 gain: 100		climbing
2001_01_24_20_27_50_sens7_grp0.dat	202750	Pioneer	climbing	7400RPM	Junction Box: 1 gain: 100		climbing
2001_01_24_20_27_50_sens7_grp1.dat	202750	Pioneer	climbing	7400RPM	Junction Box: 2 gain: 100		climbing
2001_01_24_20_27_50_sens7_grp3.dat	202750	Pioneer	climbing	7400RPM	Junction Box: 3 gain: 100		climbing
2001_10_24_20_35_40_sens6_grp0.dat	203540	Pioneer	2500 ft	6300RPM	Junction Box: 1 gain: 100		S to N, 70 Knots
2001_10_24_20_35_40_sens6_grp1.dat	203540	Pioneer	2500 ft	6300RPM	Junction Box: 2 gain: 100		S to N, 70 Knots
2001_01_24_20_35_36_sens7_grp0.dat	203536	Pioneer	2500 ft	6300RPM	Junction Box: 1 gain: 100		S to N, 70 Knots
2001_01_24_20_35_36_sens7_grp1.dat	203536	Pioneer	2500 ft	6300RPM	Junction Box: 2 gain: 100		S to N, 70 Knots
2001_01_24_20_35_36_sens7_grp3.dat	203536	Pioneer	2500 ft	6300RPM	Junction Box: 3 gain: 100		S to N, 70 Knots
2001_10_24_20_40_34_sens6_grp0.dat	204034	Pioneer	2500 ft	7800RPM	Junction Box: 1 gain: 100		N to S, 90 Knots
2001_10_24_20_40_34_sens6_grp1.dat	204034	Pioneer	2500 ft	7800RPM	Junction Box: 2 gain: 100		N to S, 90 Knots
2001_01_24_20_40_33_sens7_grp0.dat	204033	Pioneer	2500 ft	7800RPM	Junction Box: 1 gain: 100		N to S, 90 Knots
2001_01_24_20_40_33_sens7_grp1.dat	204033	Pioneer	2500 ft	7800RPM	Junction Box: 2 gain: 100		N to S, 90 Knots
2001_01_24_20_40_33_sens7_grp3.dat	204033	Pioneer	2500 ft	7800RPM	Junction Box: 3 gain: 100		N to S, 90 Knots

Filename	GPS Time (UTM)	UAV	Altitude	Speed	Set Conditions	Calibration	Comments
2001_10_24_20_40_34_sens6_grp0.dat	204542	Pioneer	2500 ft	6500RPM	Junction Box: 1 gain: 100		W to E, 70 Knots
2001_10_24_20_40_34_sens6_grp1.dat	204542	Pioneer	2500 ft	6500RPM	Junction Box: 2 gain: 100		W to E, 70 Knots
2001_01_24_20_40_33_sens7_grp0.dat	204538	Pioneer	2500 ft	6500RPM	Junction Box: 1 gain: 100		W to E, 70 Knots
2001_01_24_20_40_33_sens7_grp1.dat	204538	Pioneer	2500 ft	6500RPM	Junction Box: 2 gain: 100		W to E, 70 Knots
2001_01_24_20_40_33_sens7_grp3.dat	204538	Pioneer	2500 ft	6500RPM	Junction Box: 3 gain: 100		W to E, 70 Knots
2001_10_24_20_54_57_sens6_grp0.dat	205457	Pioneer	2500 ft	7700RPM	Junction Box: 1 gain: 100		E to W, 90 Knots
2001_10_24_20_54_57_sens6_grp1.dat	205457	Pioneer	2500 ft	7700RPM	Junction Box: 2 gain: 100		E to W, 90 Knots
2001_01_24_20_54_54_sens7_grp0.dat	205454	Pioneer	2500 ft	7700RPM	Junction Box: 1 gain: 100		E to W, 90 Knots
2001_01_24_20_54_54_sens7_grp1.dat	205454	Pioneer	2500 ft	7700RPM	Junction Box: 2 gain: 100		E to W, 90 Knots
2001_01_24_20_54_54_sens7_grp3.dat	205454	Pioneer	2500 ft	7700RPM	Junction Box: 3 gain: 100		E to W, 90 Knots
2001_10_24_20_59_29_sens6_grp0.dat	205929	Pioneer	climbing	7700RPM	Junction Box: 1 gain: 100		climbing to 4800 ft
2001_10_24_20_59_29_sens6_grp1.dat	205929	Pioneer	climbing	7700RPM	Junction Box: 2 gain: 100		climbing to 4800 ft
2001_01_24_20_59_24_sens7_grp0.dat	205924	Pioneer	climbing	7700RPM	Junction Box: 1 gain: 100		climbing to 4800 ft
2001_01_24_20_59_24_sens7_grp1.dat	205924	Pioneer	climbing	7700RPM	Junction Box: 2 gain: 100		climbing to 4800 ft
2001_01_24_20_59_24_sens7_grp3.dat	205924	Pioneer	climbing	7700RPM	Junction Box: 3 gain: 100		climbing to 4800 ft
2001_10_24_21_06_49_sens6_grp0.dat	210649	Pioneer	4800 ft	6500RPM	Junction Box: 1 gain: 100		S to N, 70 Knots
2001_10_24_21_06_49_sens6_grp1.dat	210649	Pioneer	4800 ft	6500RPM	Junction Box: 2 gain: 100		S to N, 70 Knots
2001_01_24_21_06_42_sens7_grp0.dat	210642	Pioneer	4800 ft	6500RPM	Junction Box: 1 gain: 100		S to N, 70 Knots
2001_01_24_21_06_42_sens7_grp1.dat	210642	Pioneer	4800 ft	6500RPM	Junction Box: 2 gain: 100		S to N, 70 Knots
2001_01_24_21_06_42_sens7_grp3.dat	210642	Pioneer	4800 ft	6500RPM	Junction Box: 3 gain: 100		S to N, 70 Knots
2001_10_24_21_12_42_sens6_grp0.dat	211242	Pioneer	4800 ft	7700RPM	Junction Box: 1 gain: 100		N to S, 90 Knots
2001_10_24_21_12_42_sens6_grp1.dat	211242	Pioneer	4800 ft	7700RPM	Junction Box: 2 gain: 100		N to S, 90 Knots
2001_01_24_21_12_40_sens7_grp0.dat	211240	Pioneer	4800 ft	7700RPM	Junction Box: 1 gain: 100		N to S, 90 Knots
2001_01_24_21_12_40_sens7_grp1.dat	211240	Pioneer	4800 ft	7700RPM	Junction Box: 2 gain: 100		N to S, 90 Knots
2001_01_24_21_12_40_sens7_grp3.dat	211240	Pioneer	4800 ft	7700RPM	Junction Box: 3 gain: 100		N to S, 90 Knots
2001_10_24_21_16_41_sens6_grp0.dat	211641	Pioneer	4800 ft	6500RPM	Junction Box: 1 gain: 100		W to E, 70 Knots
2001_10_24_21_16_41_sens6_grp1.dat	211641	Pioneer	4800 ft	6500RPM	Junction Box: 2 gain: 100		W to E, 70 Knots
2001_01_24_21_16_38_sens7_grp0.dat	211638	Pioneer	4800 ft	6500RPM	Junction Box: 1 gain: 100		W to E, 70 Knots
2001_01_24_21_16_38_sens7_grp1.dat	211638	Pioneer	4800 ft	6500RPM	Junction Box: 2 gain: 100		W to E, 70 Knots

Filename	GPS Time (UTM)	UAV	Altitude	Speed	Set Conditions	Calibration	Comments
2001_01_24_21_16_38_sens7_grp3.dat	211638	Pioneer	4800 ft	6500RPM	Junction Box: 3 gain: 100		W to E, 70 Knots
2001_10_24_21_22_13_sens6_grp0.dat	212213	Pioneer	4800 ft	6500RPM	Junction Box: 1 gain: 100		W to E, 70 Knots
2001_10_24_21_22_13_sens6_grp1.dat	212213	Pioneer	4800 ft	6500RPM	Junction Box: 2 gain: 100		W to E, 70 Knots
2001_01_24_21_22_09_sens7_grp0.dat	212209	Pioneer	4800 ft	6500RPM	Junction Box: 1 gain: 100		W to E, 70 Knots
2001_01_24_21_21_09_sens7_grp1.dat	212209	Pioneer	4800 ft	6500RPM	Junction Box: 2 gain: 100		W to E, 70 Knots
2001_01_24_21_22_09_sens7_grp3.dat	212209	Pioneer	4800 ft	6500RPM	Junction Box: 3 gain: 100		W to E, 70 Knots
2001_10_24_21_26_47_sens6_grp0.dat	212647	Pioneer	4800 ft	7700RPM	Junction Box: 1 gain: 100		E to W, 90 Knots
2001_10_24_21_26_47_sens6_grp1.dat	212647	Pioneer	4800 ft	7700RPM	Junction Box: 2 gain: 100		E to W, 90 Knots
2001_01_24_21_26_42_sens7_grp0.dat	212642	Pioneer	4800 ft	7700RPM	Junction Box: 1 gain: 100		E to W, 90 Knots
2001_01_24_21_26_42_sens7_grp1.dat	212642	Pioneer	4800 ft	7700RPM	Junction Box: 2 gain: 100		E to W, 90 Knots
2001_01_24_21_26_42_sens7_grp3.dat	212642	Pioneer	4800 ft	7700RPM	Junction Box: 3 gain: 100		E to W, 90 Knots
2001_10_24_21_40_15_sens6_grp0.dat	214015	N/A	N/A		Junction Box: 1 gain: 100	yes	ARL sensor-N-S
2001_10_24_21_43_55_sens6_grp1.dat	214355	N/A	N/A		Junction Box: 2 gain: 100	yes	ARL sensor-E-W
2001_01_24_21_48_20_sens7_grp0.dat	214820	N/A	N/A		Junction Box: 1 gain: 100	yes	Mic 1,2,3,4,5; 2&4 mics are bad.
2001_01_24_21_53_30_sens7_grp1.dat	215330	N/A	N/A		Junction Box: 2 gain: 100	yes	Mic 1,2,3 all mics are bad.
2001_01_24_21_57_44_sens7_grp2.dat	215744	N/A	N/A		Junction Box: 3 gain: 100	yes	Mic 1,2,3; 1&2 mics are bad.

Source: Sim, L. TUAV-Oct-01-data.xls file. U.S. Army Research Laboratory, Adelphi, MD, April 2002.

Appendix F. Test Flight Data for TUAV_Jan_02_Data

ACO PACIFIC MICROPHONES							
Filename	**GPS Time (UTM)**	**UAV**	**Altitude**	**Speed**	**Set Conditons**	**Calibration**	**Comments**
Test Date: 1/10/2002							
2002_01_10_15_30_25_sen8_grp0.dat	153025	N/A	N/A		Junction Box: 1 gain: 100	yes	Wind:1.7 Knots
2002_01_10_15_33_30_sen8_grp1.dat	153330	N/A	N/A		Junction Box: 2 gain: 100	yes	Wind:1.7 Knots
2002_01_10_15_35_40_sen8_grp2.dat	153540	N/A	N/A		Junction Box: 3 gain: 100	yes	Wind:1.7 Knots
2002_01_10_17_03_40_sen8_grp0.dat	170340	Pioneer	N/A		Junction Box: 1 gain: 100		Wind:1.5 Knots, Calm
2002_01_10_17_03_40_sen8_grp1.dat	170340	Pioneer	N/A		Junction Box: 2 gain: 100		Wind:1.5 Knots, Calm
2002_01_10_17_03_40_sen8_grp2.dat	170340	Pioneer	N/A		Junction Box: 3 gain: 100		Wind:1.5 Knots, Calm
	170637	N/A	N/A				Wind:1.2 Knots, Generator Truck near sensors
	170747	N/A	N/A				Wind: 3.0 Knots, Commercial Airplane flew by
2002_01_10_17_11_25_sen8_grp0.dat	171125	Pioneer	N/A		Junction Box: 1 gain: 100		Wind: 3.0 Knots, Generator Truck near sensors
2002_01_10_17_11_25_sen8_grp1.dat	171125	Pioneer	N/A		Junction Box: 2 gain: 100		Generator Truck near sensors
2002_01_10_17_11_25_sen8_grp2.dat	171125	Pioneer	N/A		Junction Box: 3 gain: 100		Generator Truck near sensors
	171145	N/A	N/A				Wind: 1.8 Knots, Generator Truck drove away
2002_01_10_17_12_43_sen8_grp0.dat	171243	Pioneer	2500 ft	75 Knots	Junction Box: 1 gain: 100		Wind: 1.8 Knots, Calm
2002_01_10_17_12_43_sen8_grp1.dat	171243	Pioneer	2500 ft	75 Knots	Junction Box: 2 gain: 100		Wind: 1.8 Knots, Calm
2002_01_10_17_12_43_sen8_grp2.dat	171243	Pioneer	2500 ft	75 Knots	Junction Box: 3 gain: 100		Wind: 1.8 Knots, Calm
2002_01_10_17_17_56_sen8_grp0.dat	171756	Pioneer	2500 ft	85 Knots	Junction Box: 1 gain: 100		Wind: 3.0 Knots, Wind from NW Directions
2002_01_10_17_17_56_sen8_grp1.dat	171756	Pioneer	2500 ft	85 Knots	Junction Box: 2 gain: 100		Wind: 3.0 Knots, Wind from NW Directions
2002_01_10_17_17_56_sen8_grp2.dat	171756	Pioneer	2500 ft	85 Knots	Junction Box: 3 gain: 100		Wind: 3.0 Knots, Wind from NW Directions
2002_01_10_17_20_51_sen8_grp0.dat	172051	Pioneer	2500 ft	85 Knots	Junction Box: 1 gain: 100		Wind:2.6 Knots
2002_01_10_17_20_51_sen8_grp1.dat	172051	Pioneer	2500 ft	85 Knots	Junction Box: 2 gain: 100		Wind:2.6 Knots
2002_01_10_17_20_51_sen8_grp2.dat	172051	Pioneer	2500 ft	85 Knots	Junction Box: 3 gain: 100		Wind:2.6 Knots
2002_01_10_17_25_30_sen8_grp0.dat	172530	Pioneer	2500 ft	70 Knots	Junction Box: 1 gain: 100		Calm
2002_01_10_17_25_30_sen8_grp1.dat	172530	Pioneer	2500 ft	70 Knots	Junction Box: 2 gain: 100		Calm
2002_01_10_17_25_30_sen8_grp2.dat	172530	Pioneer	2500 ft	70 Knots	Junction Box: 3 gain: 100		Calm
2002_01_10_17_29_44_sen8_grp0.dat	172944	Pioneer	2500 ft	70 Knots	Junction Box: 1 gain: 100		Calm
2002_01_10_17_29_44_sen8_grp1.dat	172944	Pioneer	2500 ft	70 Knots	Junction Box: 2 gain: 100		Calm
2002_01_10_17_29_44_sen8_grp2.dat	172944	Pioneer	2500 ft	70 Knots	Junction Box: 3 gain: 100		Calm
2002_01_10_17_34_47_sen8_grp0.dat	173447	Pioneer	2500 ft	85 Knots	Junction Box: 1 gain: 100		Calm

Filename	GPS Time (UTM)	UAV	Altitude	Speed	Set Conditons	Calibration	Comments
2002_01_10_17_34_47_sen8_grp1.dat	173447	Pioneer	2500 ft	85 Knots	Junction Box: 2 gain: 100		Calm
2002_01_10_17_34_47_sen8_grp2.dat	173447	Pioneer	2500 ft	85 Knots	Junction Box: 3 gain: 100		Calm
2002_01_10_17_38_54_sen8_grp0.dat	173854	Pioneer	2500 ft	85 Knots	Junction Box: 1 gain: 100		Calm
2002_01_10_17_38_54_sen8_grp1.dat	173854	Pioneer	2500 ft	85 Knots	Junction Box: 2 gain: 100		Calm
2002_01_10_17_38_54_sen8_grp2.dat	173854	Pioneer	2500 ft	85 Knots	Junction Box: 3 gain: 100		Calm
2002_01_10_17_44_23_sen8_grp0.dat	174423	Pioneer	2500 ft	85 Knots	Junction Box: 1 gain: 100		Calm
2002_01_10_17_44_23_sen8_grp1.dat	174423	Pioneer	2500 ft	85 Knots	Junction Box: 2 gain: 100		Calm
2002_01_10_17_44_23_sen8_grp2.dat	174423	Pioneer	2500 ft	85 Knots	Junction Box: 3 gain: 100		Calm
2002_01_10_18_05_25_sen8_grp0.dat	180525	N/A	N/A		Junction Box: 1 gain: 100	yes	Wind:1.7 Knots
2002_01_10_18_08_20_sen8_grp1.dat	180820	N/A	N/A		Junction Box: 2 gain: 100	yes	Wind:1.7 Knots
2002_01_10_18_10_50_sen8_grp2.dat	181050	N/A	N/A		Junction Box: 3 gain: 100	yes	Wind:1.7 Knots
2002_01_10_18_12_17_sen8_grp0.dat	181217	N/A	N/A		Junction Box: 1 gain: 100	yes	Background
2002_01_10_18_12_17_sen8_grp1.dat	181217	N/A	N/A		Junction Box: 2 gain: 100	yes	Background
2002_01_10_18_12_17_sen8_grp2.dat	181217	N/A	N/A		Junction Box: 3 gain: 100	yes	Background
2002_01_10_18_16_08_sen8_grp0.dat	181608	N/A	N/A			yes	
2002_01_10_18_16_08_sen8_grp1.dat	181608	N/A	N/A			yes	
2002_01_10_18_16_08_sen8_grp2.dat	181608	N/A	N/A		Junction Box: 1 gain: 100	yes	Wind: 3.0 Knots, 52 degree
					Junction Box: 2 gain: 100		Wind: 3.0 Knots, 52 degree
Test Date: 1/14/2002					Junction Box: 3 gain: 100		Wind: 3.0 Knots, 52 degree
2002_01_14_16_12_50_sen8_grp0.dat	160925	N/A	N/A		Junction Box: 1 gain: 100	yes	Wind: 3.0 Knots, 52 degree
2002_01_14_16_14_30_sen8_grp1.dat	161430	N/A	N/A		Junction Box: 2 gain: 100	yes	Wind: 3.0 Knots, 52 degree
2002_01_14_16_15_54_sen8_grp2.dat	161554	N/A	N/A		Junction Box: 3 gain: 100	yes	Wind: 3.0 Knots, 52 degree
2002_01_14_17_30_00_sen8_grp0.dat	173000	Exdrone	N/A	Various	Junction Box: 1 gain: 100		Wind: 5.2 Knots, 52 degree
2002_01_14_17_30_00_sen8_grp1.dat	173000	Exdrone	N/A	Various	Junction Box: 2 gain: 100		Wind: 5.2 Knots, 52 degree
2002_01_14_17_30_00_sen8_grp2.dat	173000	Exdrone	N/A	Various	Junction Box: 3 gain: 100		Wind: 5.2 Knots, 52 degree
2002_01_14_17_35_00_sen8_grp0.dat	173500	Exdrone	2000 ft	7900 RPM	Junction Box: 1 gain: 100		Wind: 5.2 Knots, 52 degree
2002_01_14_17_35_00_sen8_grp1.dat	173500	Exdrone	2000 ft	7900 RPM	Junction Box: 2 gain: 100		Wind: 5.2 Knots, 52 degree
2002_01_14_17_35_00_sen8_grp2.dat	173500	Exdrone	2000 ft	7900 RPM	Junction Box: 3 gain: 100		Wind: 5.2 Knots, 52 degree
2002_01_14_17_39_56_sen8_grp0.dat	173956	Exdrone	2000 ft	7000 RPM	Junction Box: 1 gain: 100		Wind: 5.2 Knots, 52 degree
2002_01_14_17_39_56_sen8_grp1.dat	173956	Exdrone	2000 ft	7000 RPM	Junction Box: 2 gain: 100		Wind: 5.2 Knots, 52 degree

Filename	GPS Time (UTM)	UAV	Altitude	Speed	Set Conditons	Calibration	Comments
2002_01_14_17_39_56_sen8_grp2.dat	173956	Exdrone	2000 ft	7000 RPM	Junction Box: 3 gain: 100		Wind: 5.2 Knots, 52 degree
2002_01_14_17_43_10_sen8_grp0.dat	174310	Exdrone	2000 ft	7000 RPM	GPS Problem		Emergency Stop
2002_01_14_17_43_10_sen8_grp1.dat	174310	Exdrone	2000 ft	7000 RPM	Junction Box: 1 gain: 100		Wind: 3.8 Knots, 52 degree
2002_01_14_17_43_10_sen8_grp2.dat	174310	Exdrone	2000 ft	7000 RPM	Junction Box: 2 gain: 100		Wind: 3.8 Knots, 52 degree
	174500	Exdrone		Engine Problem	Junction Box: 3 gain: 100		Wind: 3.8 Knots, 52 degree
2002_01_14_18_05_02_sen8_grp0.dat	180502	Exdrone	Climbing	7000 RPM	Junction Box: 1 gain: 100		Wind: 3.8 Knots, 52 degree
2002_01_14_18_05_02_sen8_grp1.dat	180502	Exdrone	Climbing	7000 RPM	Junction Box: 2 gain: 100		Wind: 3.8 Knots, 52 degree
2002_01_14_18_05_02_sen8_grp2.dat	180502	Exdrone	Climbing	7000 RPM	Junction Box: 3 gain: 100		Wind: 3.8 Knots, 52 degree
2002_01_14_18_11_09_sen8_grp0.dat	181109	Exdrone	2000 ft	7000 RPM	Junction Box: 1 gain: 100		Wind: 2.9 Knots, 52 degree
2002_01_14_18_11_09_sen8_grp1.dat	181109	Exdrone	2000 ft	7000 RPM	Junction Box: 2 gain: 100		Wind: 2.9 Knots, 52 degree
2002_01_14_18_11_09_sen8_grp2.dat	181109	Exdrone	2000 ft	7000 RPM	Junction Box: 3 gain: 100		Wind: 2.9 Knots, 52 degree
2002_01_14_18_17_05_sen8_grp0.dat	181705	Exdrone	2000 ft	8000 RPM	Junction Box: 1 gain: 100		Wind: 2.9 Knots, 52 degree
2002_01_14_18_17_05_sen8_grp1.dat	181705	Exdrone	2000 ft	8000 RPM	Junction Box: 2 gain: 100		Wind: 2.9 Knots, 52 degree
2002_01_14_18_17_05_sen8_grp2.dat	181705	Exdrone	2000 ft	8000 RPM	Junction Box: 3 gain: 100		Wind: 2.9 Knots, 52 degree
2002_01_14_18_22_28_sen8_grp0.dat	182228	Exdrone	~1000 ft	8100 RPM	Junction Box: 1 gain: 100		Wind: 2.5 Knots, 52 degree
2002_01_14_18_22_28_sen8_grp1.dat	182228	Exdrone	~1000 ft	8100 RPM	Junction Box: 2 gain: 100		Wind: 2.5 Knots, 52 degree
2002_01_14_18_22_28_sen8_grp2.dat	182228	Exdrone	~1000 ft	8100 RPM	Junction Box: 3 gain: 100		Wind: 2.5 Knots, 52 degree
2002_01_14_18_28_33_sen8_grp0.dat	182833	Exdrone	1000 ft	7000 RPM	Junction Box: 1 gain: 100		Wind: 2.0 Knots, 52 degree
2002_01_14_18_28_33_sen8_grp1.dat	182833	Exdrone	1000 ft	7000 RPM	Junction Box: 2 gain: 100		Wind: 2.0 Knots, 52 degree
2002_01_14_18_28_33_sen8_grp2.dat	182833	Exdrone	1000 ft	7000 RPM	Junction Box: 3 gain: 100		Wind: 3.2 Knots, 52 degree
2002_01_14_18_36_19_sen8_grp0.dat	183619	Exdrone	1000 ft	8200 RPM	Junction Box: 1 gain: 100		Wind: 3.2 Knots, 52 degree
2002_01_14_18_36_19_sen8_grp1.dat	183619	Exdrone	1000 ft	8200 RPM	Junction Box: 2 gain: 100		Wind: 3.2 Knots, 52 degree
2002_01_14_18_36_19_sen8_grp2.dat	183619	Exdrone	1000 ft	8200 RPM	Junction Box: 3 gain: 100		Wind: 2.0 Knots, 52 degree
2002_01_14_18_42_42_sen8_grp0.dat	184242	Exdrone	1000 ft	7000 RPM	Junction Box: 1 gain: 100		Background
2002_01_14_18_42_42_sen8_grp1.dat	184242	Exdrone	1000 ft	7000 RPM	Junction Box: 2 gain: 100		Background
2002_01_14_18_42_42_sen8_grp2.dat	184242	Exdrone	1000 ft	7000 RPM	Junction Box: 3 gain: 100		Background
2002_01_14_18_55_00_sen8_grp0.dat	185500	N/A	N/A		Junction Box: 1 gain: 100		
2002_01_14_18_55_00_sen8_grp1.dat	185500	N/A	N/A		Junction Box: 2 gain: 100		
2002_01_14_18_55_00_sen8_grp2.dat	185500	N/A	N/A		Junction Box: 3 gain: 100		
2002_01_14_19_07_29_sen8_grp0.dat	190729	N/A	N/A			yes	

Filename	GPS Time (UTM)	UAV	Altitude	Speed	Set Conditons	Calibration	Comments
2002_01_14_19_10_25_sen8_grp1.dat	191025	N/A	N/A		Junction Box: 1 gain: 100	yes	
2002_01_14_19_11_45_sen8_grp2.dat	191145	N/A	N/A		Junction Box: 2 gain: 100	yes	
Test Date: 1/15/2002					Junction Box: 3 gain: 100		
2002_01_15_12_45_37_sen8_grp0.dat	124537	N/A	N/A		Junction Box: 1 gain: 1000	yes	Wind: 1.0 Knot, Calm
2002_01_15_12_46_58_sen8_grp1.dat	124658	N/A	N/A		Junction Box: 2 gain: 1000	yes	Calm
2002_01_15_12_48_15_sen8_grp2.dat	124815	N/A	N/A		Junction Box: 3 gain: 1000	yes	Calm
2002_01_15_12_53_00_sen8_grp0.dat	125300	Pointer	Refer to GPS	Electric Motor	Junction Box: 1 gain: 1000		Background
2002_01_15_12_53_00_sen8_grp1.dat	125300	Pointer	Refer to GPS	Electric Motor	Junction Box: 2 gain: 1000		Background
2002_01_15_12_53_00_sen8_grp2.dat	125300	Pointer	Refer to GPS	Electric Motor	Junction Box: 3 gain: 1000		Background
2002_01_15_13_48_52_sen8_grp0.dat	134852	N/A	N/A		Junction Box: 1 gain: 100	yes	
2002_01_15_13_48_52_sen8_grp1.dat	134852	N/A	N/A		Junction Box: 2 gain: 100	yes	
2002_01_15_13_48_52_sen8_grp2.dat	134852	N/A	N/A		Junction Box: 3 gain: 100	yes	
2002_01_15_14_04_24_sen8_grp0.dat	140424	N/A	N/A			yes	
2002_01_15_14_05_47_sen8_grp1.dat	150547	N/A	N/A		Junction Box: 1 gain: 100	yes	
2002_01_15_14_07_17_sen8_grp2.dat	140717	N/A	N/A		Junction Box: 2 gain: 100	yes	
Test Date: 1/16/2002					Junction Box: 3 gain: 100		
2002_01_16_12_13_58_sen8_grp0.dat	121358	N/A	N/A		Junction Box: 1 gain: 1000	yes	Wind: 4.2 Knots, Car Noise
2002_01_16_12_15_20_sen8_grp1.dat	121520	N/A	N/A		Junction Box: 2 gain: 1000	yes	Wind: 4.2 Knots, Car Noise
2002_01_16_12_16_20_sen8_grp2.dat	121620	N/A	N/A		Junction Box: 3 gain: 1000	yes	Wind: 4.2 Knots, Car Noise
2002_01_16_12_37_42_sen8_grp0.dat	123742	Pointer	Refer to GPS	Electric Motor	Junction Box: 1 gain: 1000		Wind: 4.2 Knots, Car Noise
2002_01_16_12_37_42_sen8_grp1.dat	123742	Pointer	Refer to GPS	Electric Motor	Junction Box: 2 gain: 1000		Wind: 4.2 Knots, Car Noise
2002_01_16_12_37_42_sen8_grp2.dat	123742	Pointer	Refer to GPS	Electric Motor	Junction Box: 3 gain: 1000		Wind: 4.2 Knots, Car Noise
2002_01_16_12_58_32_sen8_grp0.dat	125832	Pointer	~200 ft	Electric Motor	Junction Box: 1 gain: 1000		Wind: 5.0 Knots, Car Noise
2002_01_16_12_58_32_sen8_grp1.dat	125832	Pointer	~200 ft	Electric Motor	Junction Box: 2 gain: 1000		Wind: 5.0 Knots, Car Noise
2002_01_16_12_58_32_sen8_grp2.dat	125832	Pointer	~200 ft	Electric Motor	Junction Box: 3 gain: 1000		Wind: 5.0 Knots, Car Noise
2002_01_16_13_27_10_sen8_grp0.dat	132710	Pointer	50-100 ft	Electric Motor	Junction Box: 1 gain: 1000		Wind: 5.0 Knots, Car Noise
2002_01_16_13_27_10_sen8_grp1.dat	132710	Pointer	50-100 ft	Electric Motor	Junction Box: 2 gain: 1000		Wind: 5.0 Knots, Car Noise
2002_01_16_13_27_10_sen8_grp2.dat	132710	Pointer	50-100 ft	Electric Motor	Junction Box: 3 gain: 1000		Wind: 5.0 Knots, Car Noise
2002_01_16_13_38_24_sen8_grp0.dat	133824	Pointer	50-100 ft	Electric Motor	Junction Box: 1 gain: 1000		Wind: 6.0 Knots, Car Noise
2002_01_16_13_38_24_sen8_grp1.dat	133824	Pointer	50-100 ft	Electric Motor	Junction Box: 2 gain: 1000		Wind: 6.0 Knots, Car Noise

Filename	GPS Time (UTM)	UAV	Altitude	Speed	Set Conditons	Calibration	Comments
2002_01_16_13_38_24_sen8_grp2.dat	133824	Pointer	50-100 ft	Electric Motor	Junction Box: 3 gain: 1000		Wind: 6.0 Knots, Car Noise
2002_01_16_13_45_54_sen8_grp0.dat	134554	Pointer	150 ft	Electric Motor	Junction Box: 1 gain: 1000		Wind: 6.0 Knots, Car Noise
2002_01_16_13_45_54_sen8_grp1.dat	134554	Pointer	150 ft	Electric Motor	Junction Box: 2 gain: 1000		Wind: 6.0 Knots, Car Noise
2002_01_16_13_45_54_sen8_grp2.dat	134554	Pointer	150 ft	Electric Motor	Junction Box: 3 gain: 1000		Wind: 6.0 Knots, Car Noise
2002_01_16_13_50_16_sen8_grp0.dat	135016	Pointer	150 ft	Electric Motor	Junction Box: 1 gain: 1000		Wind: 6.0 Knots, Car Noise
2002_01_16_13_50_16_sen8_grp1.dat	135016	Pointer	150 ft	Electric Motor	Junction Box: 2 gain: 1000		Wind: 6.0 Knots, Car Noise
2002_01_16_13_50_16_sen8_grp2.dat	135016	Pointer	150 ft	Electric Motor	Junction Box: 3 gain: 1000		Wind: 6.0 Knots, Car Noise
2002_01_16_13_54_00_sen8_grp0.dat	135400	Pointer	250 ft	Electric Motor	Junction Box: 1 gain: 1000		Wind: 6.0 Knots, Car Noise
2002_01_16_13_54_00_sen8_grp1.dat	135400	Pointer	250 ft	Electric Motor	Junction Box: 2 gain: 1000		Wind: 6.0 Knots, Car Noise
2002_01_16_13_54_00_sen8_grp2.dat	135400	Pointer	250 ft	Electric Motor	Junction Box: 3 gain: 1000		Wind: 6.0 Knots, Car Noise
2002_01_16_13_58_47_sen8_grp0.dat	135847	Pointer	250 ft	Electric Motor	Junction Box: 1 gain: 100		
2002_01_16_13_58_47_sen8_grp1.dat	135847	Pointer	250 ft	Electric Motor	Junction Box: 2 gain: 100		
2002_01_16_13_58_47_sen8_grp2.dat	135847	Pointer	250 ft	Electric Motor	Junction Box: 3 gain: 100		
2002_01_16_17_06_22_sen8_grp0.dat	170622	N/A	N/A		Junction Box: 1 gain: 1000	yes	Background
2002_01_16_17_09_10_sen8_grp1.dat	170910	N/A	N/A		Junction Box: 2 gain: 1000	yes	Background
2002_01_16_17_10_25_sen8_grp2.dat	171025	N/A	N/A		Junction Box: 3 gain: 1000	yes	Background
2002_01_16_17_13_51_sen8_grp0.dat	171351	N/A	N/A		Junction Box: 1 gain: 1000	yes	Wind: 6.5 Knots
2002_01_16_17_13_51_sen8_grp1.dat	171351	N/A	N/A		Junction Box: 2 gain: 1000	yes	Wind: 6.5 Knots
2002_01_16_17_13_51_sen8_grp2.dat	171351	N/A	N/A		Junction Box: 3 gain: 1000	yes	Wind: 6.5 Knots
2002_01_16_17_29_25_sen8_grp0.dat	172925	Pointer	150 ft	Electric Motor	Junction Box: 1 gain: 1000		Wind: 7.8 Knots
2002_01_16_17_29_25_sen8_grp1.dat	172925	Pointer	150 ft	Electric Motor	Junction Box: 2 gain: 1000		Wind: 7.8 Knots
2002_01_16_17_29_25_sen8_grp2.dat	172925	Pointer	150 ft	Electric Motor	Junction Box: 3 gain: 1000		Wind: 7.8 Knots
2002_01_16_17_45_55_sen8_grp0.dat	174555	Pointer	150 ft	Electric Motor	Junction Box: 1 gain: 1000		Wind: 6.5 Knots
2002_01_16_17_45_55_sen8_grp1.dat	174555	Pointer	150 ft	Electric Motor	Junction Box: 2 gain: 1000		Wind: 6.5 Knots
2002_01_16_17_45_55_sen8_grp2.dat	174555	Pointer	150 ft	Electric Motor	Junction Box: 3 gain: 1000		Wind: 6.5 Knots
2002_01_16_17_52_31_sen8_grp0.dat	175231	Pointer	150 ft	Electric Motor	Junction Box: 1 gain: 1000		Wind: 7.0 Knots
2002_01_16_17_52_31_sen8_grp1.dat	175231	Pointer	150 ft	Electric Motor	Junction Box: 2 gain: 1000		Wind: 7.0 Knots
2002_01_16_17_52_31_sen8_grp2.dat	175231	Pointer	150 ft	Electric Motor	Junction Box: 3 gain: 1000		Wind: 7.0 Knots
2002_01_16_17_56_49_sen8_grp0.dat	175649	Pointer	150 ft	Electric Motor	Junction Box: 1 gain: 1000		Wind: 6.5 Knots

Filename	GPS Time (UTM)	UAV	Altitude	Speed	Set Conditons	Calibration	Comments
2002_01_16_17_56_49_sen8_grp1.dat	175649	Pointer	150 ft	Electric Motor	Junction Box: 2 gain: 1000		Wind: 6.5 Knots
2002_01_16_17_56_49_sen8_grp2.dat	175649	Pointer	150 ft	Electric Motor	Junction Box: 3 gain: 1000		Wind: 6.5 Knots
2002_01_16_18_01_07_sen8_grp0.dat	180107	Pointer	150 ft	Electric Motor	Junction Box: 1 gain: 1000		Wind: 8.5 Knots
2002_01_16_18_01_07_sen8_grp1.dat	180107	Pointer	150 ft	Electric Motor	Junction Box: 2 gain: 1000		Wind: 8.5 Knots
2002_01_16_18_01_07_sen8_grp2.dat	180107	Pointer	150 ft	Electric Motor	Junction Box: 3 gain: 1000		Wind: 8.5 Knots
2002_01_16_18_16_11_sen8_grp0.dat	181611	Pointer	150 ft	Electric Motor	Junction Box: 1 gain: 1000		Wind: 9.0 Knots
2002_01_16_18_16_11_sen8_grp1.dat	181611	Pointer	150 ft	Electric Motor	Junction Box: 2 gain: 1000		Wind: 9.0 Knots
2002_01_16_18_16_11_sen8_grp2.dat	181611	Pointer	150 ft	Electric Motor	Junction Box: 3 gain: 1000		Wind: 9.0 Knots
2002_01_16_18_21_32_sen8_grp0.dat	182132	Pointer	150 ft	Electric Motor	Junction Box: 1 gain: 1000		Wind: 10.2 Knots
2002_01_16_18_21_32_sen8_grp1.dat	182132	Pointer	150 ft	Electric Motor	Junction Box: 2 gain: 1000		Wind: 10.2 Knots
2002_01_16_18_21_32_sen8_grp2.dat	182132	Pointer	150 ft	Electric Motor	Junction Box: 3 gain: 1000		Wind: 10.2 Knots
2002_01_16_18_27_16_sen8_grp0.dat	182716	Pointer	150 ft	Electric Motor	Junction Box: 1 gain: 1000		Wind: 6.0 Knots
2002_01_16_18_27_16_sen8_grp1.dat	182716	Pointer	150 ft	Electric Motor	Junction Box: 2 gain: 1000		Wind: 6.0 Knots
2002_01_16_18_27_16_sen8_grp2.dat	182716	Pointer	150 ft	Electric Motor	Junction Box: 3 gain: 1000		Wind: 6.0 Knots
2002_01_16_18_38_10_sen8_grp0.dat	183810	Pointer	150 ft	Electric Motor	Junction Box: 1 gain: 1000		Wind: 10.0 Knots
2002_01_16_18_38_10_sen8_grp1.dat	183810	Pointer	150 ft	Electric Motor	Junction Box: 2 gain: 1000		Wind: 10.0 Knots
2002_01_16_18_38_10_sen8_grp2.dat	183810	Pointer	150 ft	Electric Motor	Junction Box: 3 gain: 1000		Wind: 10.0 Knots
2002_01_16_18_44_08_sen8_grp0.dat	184408	Pointer	150 ft	Electric Motor	Junction Box: 1 gain: 1000		Wind: 7.0 Knots
2002_01_16_18_44_08_sen8_grp1.dat	184408	Pointer	150 ft	Electric Motor	Junction Box: 2 gain: 1000		Wind: 7.0 Knots
2002_01_16_18_44_08_sen8_grp2.dat	184408	Pointer	150 ft	Electric Motor	Junction Box: 3 gain: 1000		Wind: 7.0 Knots
2002_01_16_18_48_23_sen8_grp0.dat	184823	Pointer	100 ft	Electric Motor	Junction Box: 1 gain: 1000		Wind: 8.1 Knots
2002_01_16_18_48_23_sen8_grp1.dat	184823	Pointer	100 ft	Electric Motor	Junction Box: 2 gain: 1000		Wind: 8.1 Knots
2002_01_16_18_48_23_sen8_grp2.dat	184823	Pointer	100 ft	Electric Motor	Junction Box: 3 gain: 1000		Wind: 8.1 Knots
2002_01_16_18_51_53_sen8_grp0.dat	185153	Pointer	100 ft	Electric Motor	Junction Box: 1 gain: 100		
2002_01_16_18_51_53_sen8_grp1.dat	185153	Pointer	100 ft	Electric Motor	Junction Box: 2 gain: 100		
2002_01_16_18_51_53_sen8_grp2.dat	185153	Pointer	100 ft	Electric Motor	Junction Box: 3 gain: 100		
2002_01_16_19_07_18_sen8_grp0.dat	190718	N/A	N/A			yes	
2002_01_16_19_08_42_sen8_grp1.dat	190842	N/A	N/A		Junction Box: 1 gain: 100	yes	
2002_01_16_19_09_35_sen8_grp2.dat	190935	N/A	N/A		Junction Box: 2 gain: 100	yes	

Filename	GPS Time (UTM)	UAV	Altitude	Speed	Set Conditons	Calibration	Comments
Test Date: 1/17/2002					Junction Box: 3 gain: 100		
2002_01_17_12_15_00_sen8_grp0.dat	121500	N/A	N/A		Junction Box: 1 gain: 1000	yes	Background
2002_01_17_12_16_05_sen8_grp1.dat	121605	N/A	N/A		Junction Box: 2 gain: 1000	yes	Background
2002_01_17_12_17_09_sen8_grp2.dat	121709	N/A	N/A		Junction Box: 3 gain: 1000	yes	Background
2002_01_17_12_19_10_sen8_grp0.dat	121910	N/A	N/A		Junction Box: 1 gain: 1000	yes	Wind: 6.5 Knots
2002_01_17_12_19_10_sen8_grp1.dat	121910	N/A	N/A		Junction Box: 2 gain: 1000	yes	Wind: 6.5 Knots
2002_01_17_12_19_10_sen8_grp2.dat	121910	N/A	N/A		Junction Box: 3 gain: 1000	yes	Wind: 6.5 Knots
2002_01_17_12_28_23_sen8_grp0.dat	122823	Pointer	150 ft	Electric Motor	Junction Box: 1 gain: 1000		Wind: 8.1 Knots
2002_01_17_12_28_23_sen8_grp1.dat	122823	Pointer	150 ft	Electric Motor	Junction Box: 2 gain: 1000		Wind: 8.1 Knots
2002_01_17_12_28_23_sen8_grp2.dat	122823	Pointer	150 ft	Electric Motor	Junction Box: 3 gain: 1000	Wind: 8.1 Knots	
2002_01_17_12_33_15_sen8_grp0.dat	123315	Pointer	150 ft	Electric Motor	Junction Box: 1 gain: 1000	Wind: 7.4 Knots	
2002_01_17_12_33_15_sen8_grp1.dat	123315	Pointer	150 ft	Electric Motor	Junction Box: 2 gain: 1000	Wind: 7.4 Knots	
2002_01_17_12_33_15_sen8_grp2.dat	123315	Pointer	150 ft	Electric Motor	Junction Box: 3 gain: 1000	Wind: 7.4 Knots	
2002_01_17_13_31_38_sen8_grp0.dat	133138	Pointer	150 ft	Electric Motor	Junction Box: 1 gain: 1000	Wind: 10.2 Knots	
2002_01_17_13_31_38_sen8_grp1.dat	133138	Pointer	150 ft	Electric Motor	Junction Box: 2 gain: 1000	Wind: 10.2 Knots	
2002_01_17_13_31_38_sen8_grp2.dat	133138	Pointer	150 ft	Electric Motor	Junction Box: 3 gain: 1000	Wind: 10.2 Knots	
2002_01_17_13_34_33_sen8_grp0.dat	133433	Pointer	150 ft	Electric Motor	Junction Box: 1 gain: 1000	Wind: 12.8 Knots	
2002_01_17_13_34_33_sen8_grp1.dat	133433	Pointer	150 ft	Electric Motor	Junction Box: 2 gain: 1000	Wind: 12.8 Knots	
2002_01_17_13_34_33_sen8_grp2.dat	133433	Pointer	150 ft	Electric Motor	Junction Box: 3 gain: 1000	Wind: 12.8 Knots	
2002_01_17_13_41_04_sen8_grp0.dat	134104	Pointer	150 ft	Electric Motor	Junction Box: 1 gain: 1000	Wind: 15.4 Knots	
2002_01_17_13_41_04_sen8_grp1.dat	134104	Pointer	150 ft	Electric Motor	Junction Box: 2 gain: 1000	Wind: 15.4 Knots	
2002_01_17_13_41_04_sen8_grp2.dat	134104	Pointer	150 ft	Electric Motor	Junction Box: 3 gain: 1000	Wind: 15.4 Knots	
2002_01_17_13_45_13_sen8_grp0.dat	134513	Pointer	150 ft	Electric Motor	Junction Box: 1 gain: 1000	Wind: 7.0 Knots	
2002_01_17_13_45_13_sen8_grp1.dat	134513	Pointer	150 ft	Electric Motor	Junction Box: 2 gain: 1000	Wind: 7.0 Knots	
2002_01_17_13_45_13_sen8_grp2.dat	134513	Pointer	150 ft	Electric Motor	Junction Box: 3 gain: 1000	Wind: 7.0 Knots	
2002_01_17_13_49_30_sen8_grp0.dat	134930	Pointer	150 ft	Electric Motor			
2002_01_17_13_49_30_sen8_grp1.dat	134930	Pointer	150 ft	Electric Motor			
2002_01_17_13_49_30_sen8_grp2.dat	134930	Pointer	150 ft	Electric Motor			

Source: Sim, L. TUAV-Jan-02-data.xls file. U.S. Army Research Laboratory, Adelphi, MD, April 2002.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	December 2002	Final, June 2001 to April 2002

4. TITLE AND SUBTITLE
Acoustic Data Collection of Tactical UAV's (TUAVs)

5. FUNDING NUMBERS
DA PR:
PE:

6. AUTHOR(S)
Tien Pham and Leng Sim

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
U.S. Army Research Laboratory
Attn: AMSRL-SE-SA
2800 Powder Mill Road
Adelphi, MD 20783-1197

8. PERFORMING ORGANIZATION REPORT NUMBER
ARL-TR-2749

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Army Research Laboratory
2800 Powder Mill Road
Adelphi, MD 20783-1197

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES
ARL PR:
AMS code:

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

This report discusses the data collection experiments of tactical unmanned air vehicles (TUAVs) conducted by the U.S. Army Research Laboratory of Webster Airfield, Patuxent River, MD in October 2001 and January 2002. The purpose of these data collection experiments was to collect raw acoustic signatures of TUAVs and to develop an acoustic database to support activities of the Action Group 6 (AG6) under the Technical Cooperative Program. The AG6's main objectives are to improve the understanding and utilization of acoustic sensor technology and to evaluate acoustic sensor performance in the detection, tracking, and classification of TUAVs.

14. SUBJECT TERMS	15. NUMBER OF PAGES
TUAV, acoustics, data	46
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. Z39-18
298-102